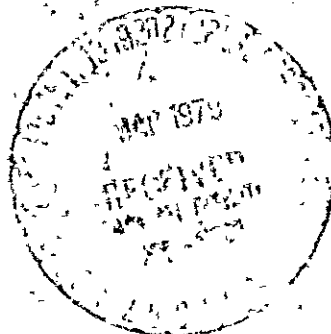
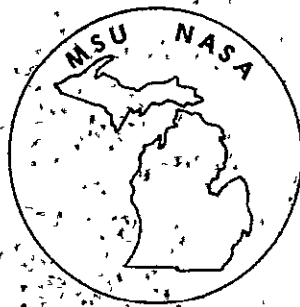


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# IDENTIFICATION OF WILD AREAS IN SOUTHERN LOWER MICHIGAN



IDENTIFICATION OF WILD AREAS  
IN  
SOUTHERN LOWER MICHIGAN

Submitted to  
Michigan Department of Natural Resources

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and  
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## Introduction

On August 3, 1972 the Governor of the State of Michigan approved House Bill No. 4881, the "Wilderness and Natural Areas Act of 1972." The bill authorizes the Department of Natural Resources (DNR) to set aside and regulate tracts of undeveloped state land and water for natural preservation, called Wild Areas. Ideally, these wilderness-like areas should be near urban centers of more than 100,000 population. Once dedicated, activities such as altering of vegetation, easements, mineral exploration and commercial enterprise would be prohibited.

At the request of the Land Resource Programs Division of the Department of Natural Resources, the Remote Sensing Project (RSP) developed an inventory methodology to identify potential Wild Area sites. A list of site criteria were formulated and tested in six selected counties. Potential sites were initially identified from LANDSAT satellite imagery. A detailed study of the soil, vegetation and relief characteristics of each site based on both high-altitude aerial photographs and existing map data was conducted to eliminate unsuitable sites. Ground reconnaissance of the remaining Wild Areas was made to verify suitability and acquire information on wildlife and general aesthetics.

## Wild Area Criteria

Before a methodology could be developed, Wild Area had to be defined.

The statutory definition is:

"a tract of undeveloped state land or water under control of the Department and dedicated and regulated by the



Natural Resources Commission pursuant to the Wilderness and Natural Areas Act which:

- 1) is less than 3,000 acres;
- 2) has outstanding opportunities for personal exploration, challenge or contact with natural features of the landscape and its biological community;
- 3) possesses one or more of the following characteristics of a wilderness area:
  - a) generally appears to have been affected primarily by forces of nature with the imprint of man's work substantially unnoticeable;
  - b) has outstanding opportunities for solitude or a primitive and unconfined type of recreation;
  - c) contains ecological, geological or other features of scientific, scenic or historical value."

This definition was accompanied by the urging: "To provide such areas insofar as possible near urban centers of more than 100,000." However, this describes thousands of acres in the Lower Peninsula. With this in mind, the DNR developed their own guidelines and specifications:

1. That sitings lie south of T16N, and be within 50 miles or one hour's driving time from metropolitan centers, i.e., Tri-Cities, Muskegon, Grand Rapids, Kalamazoo, Battle Creek, Lansing, South Bend-Niles, Monroe-Toledo, Flint, Metropolitan Detroit, Jackson, and Ann Arbor.
2. That the "Wild Areas" be generally undeveloped, compact, contiguous natural areas of 300 or more acres; cultural intrusions such as trail roads, abandoned farms, gravel pits, etc. should be at a minimum. Smaller areas would qualify only if they give a feeling of isolation or seclusion, e.g. a deep gorge or a compact wooded area.

3. Rugged topography with a variety of interesting terrain is preferred, but gentle (20 feet or more local relief per 40 acres) is acceptable.
4. 50%+ tree cover is preferred, although it may be sparse, second growth or low quality.
5. Although wetlands and water bodies are interesting features for a Wild Area, they should not comprise over 75% of a Wild Area.
6. Flexibility when implementing these guidelines is a must, given the topographic assets in southern lower Michigan. Although these criteria may be stringently applied to potential sites in Grand Rapids, the landscape around the Tri-Cities demands relaxation of the guidelines.

To arrive at a working definition, the RSP supplemented these guidelines with interviews and research. The final criteria (Fig. 1) consist of specific physical and cultural features considered important in evaluating the suitability of potential Wild Areas.

#### Study Area

South of T16N, the Lower Peninsula was divided into six sections which were geomorphologically homogeneous and one county from each section was chosen to test the Wild Area criteria. The six counties (Fig. 2) selected lie between the major urban centers of southern lower Michigan and their terrain varies from flat lake beds in Bay County to moraine systems in Livingston County to sand dunes in Allegan County.

Figure 1.-WILD AREAS CRITERIA FOR MICHIGAN

|                            |                                 |                                   |                                                                     |
|----------------------------|---------------------------------|-----------------------------------|---------------------------------------------------------------------|
| I. AREA                    | IV. LANDFORM TYPE               | V. VEGETATION                     | VII. LOCATION                                                       |
| A. 80-319 acres            | A. Glacial                      | A. Type                           | A. Distance in Kilometers from Population Centers (100,000 or more) |
| B. 320-639 acres           | 1. Lacustrine Plain             | B. Composition                    | B. Breakdown by Surface Types                                       |
| C. 640-1279 acres          | 2. Outwash Plain                | 1. % Broadleaf Forest             | 1. 4-lane Limited Access                                            |
| D. 1280-2999 acres         | 3. Ground Moraine (Till Plain)  | 2. % Coniferous Forest            | 2. 4-lane Highway                                                   |
| II. TOPOGRAPHY             | 4. End Moraine                  | 3. % Rangeland (Shrubs & Grasses) | 3. 2-lane Paved                                                     |
| A. Local Relief            | 5. Esker                        | C. Maturity                       | 4. Improved (gravel, stone)                                         |
| 1. 0-49'                   | 6. Drumlin                      | VI. HYDROGRAPHY                   | C. Estimated Travel Time                                            |
| 2. 50-99'                  | 7. Kame                         | A. Density                        | VIII. HUMAN INFLUENCE                                               |
| 3. 100-199'                | 8. Other Stagnation Features    | 1. Wetlands                       | A. Cultural                                                         |
| 4. 200-399'                | B. Fluvial                      | a. 0-10%                          | B. Historical                                                       |
| 5. 400-699'                | 1. Floodplain                   | b. 11-30%                         | C. Habitat Modifications                                            |
| 6. 700' or more            | 2. Delta                        | c. 31-75%                         | IX. PERIPHERAL LAND USE                                             |
| B. Maximum Slope           | 3. Stream Terraces              | 2. Open Water and Streams         | A. Natural Cover                                                    |
| 1. 0-6%                    | 4. Cliff, Bluff, Scarp          | a. <1%                            | B. Land Use                                                         |
| 2. 6-12%                   | 5. Stream Cut Valleys or Gorges | b. 1-40%                          |                                                                     |
| 3. 12-18%                  | 6. Other                        | c. 41-75%                         |                                                                     |
| 4. 18%+                    | C. Wave Action                  | B. Water Features                 |                                                                     |
| III. SOILS                 | 1. Beach Ridges                 | 1. Open Water                     |                                                                     |
| A. Predominant Drainage    | 2. Spits, Sand Bars             | a. Pond (<5 acres)                |                                                                     |
| 1. Poorly Drained          | 3. Bluff, Cliff, Scarp          | b. Lake (>5 acres)                |                                                                     |
| 2. Somewhat Poorly Drained | 4. Other                        | 2. Stream                         |                                                                     |
| 3. Well Drained            | D. Eolian                       | a. Channel Width >50'             |                                                                     |
| B. Predominant Texture     | 1. Sand Dune                    | b. Channel Width <10'             |                                                                     |
| 1. Organic                 | 2. Other                        | c. Channel Width 10'-50'          |                                                                     |
| 2. Sand                    | E. Karst                        | 3. Swamp/Marsh                    |                                                                     |
| 3. Clay                    | 1. Sinkhole                     | 4. Bog                            |                                                                     |
| 4. Loam                    | 2. Cave                         | 5. Springs                        |                                                                     |
|                            | 3. Other                        | 6. Rapids                         |                                                                     |
|                            | F. Rock Outcrop                 | 7. Waterfalls                     |                                                                     |

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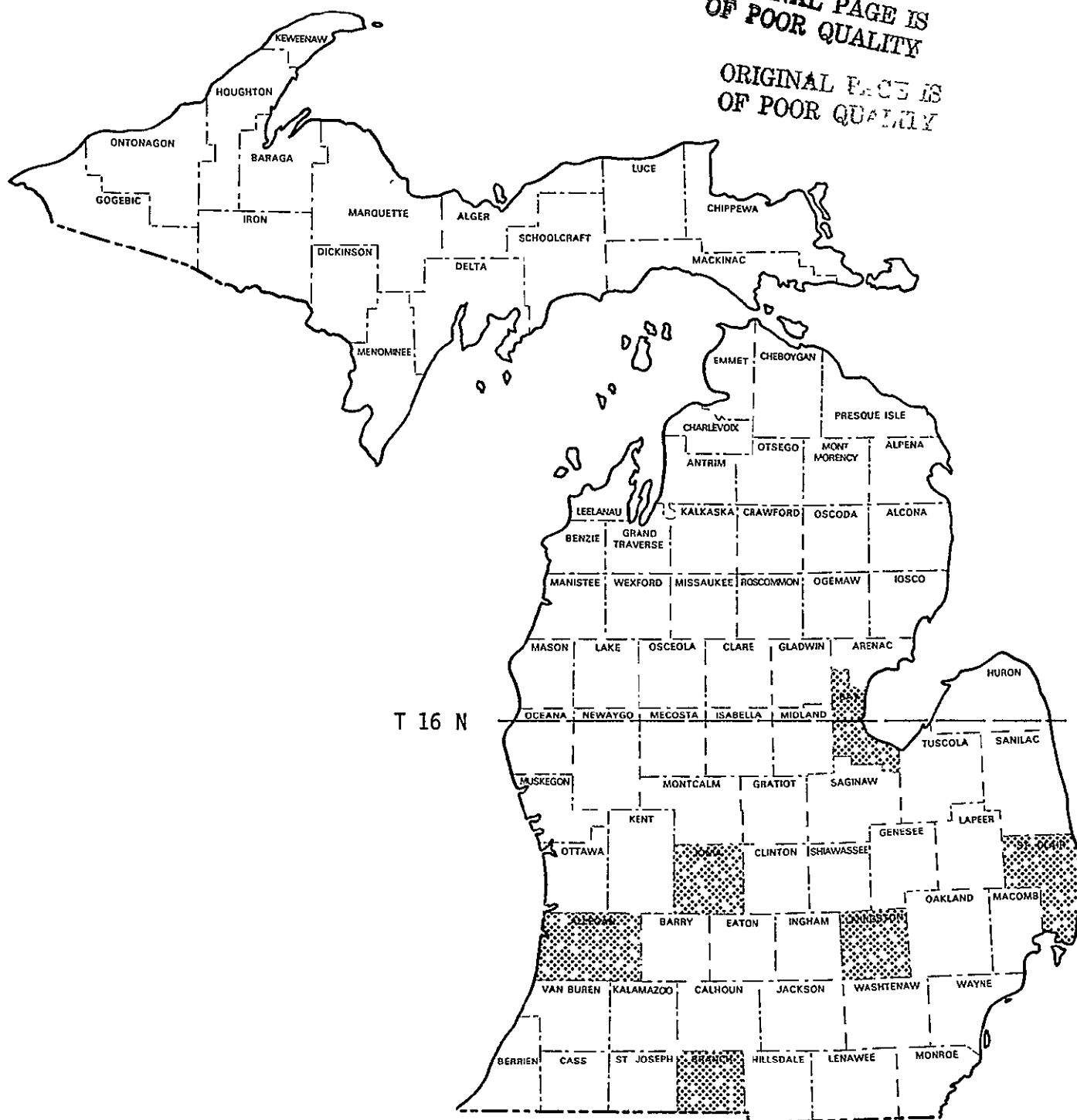


Figure 2.--Wild Area test counties.

### Grading Scheme

In order to rank Wild Areas in each county, a grading scheme was devised with point values assigned to each categorical class of the Wild Area Criteria (Fig. 3). In designing the grading system, the general categories were first ranked in order of importance. The number of possible points allotted to each category corresponded to this ranking, such that greater weight was given to those ranked higher. Likewise, within each general category, some features were viewed as more desirable than others, so higher point values were allocated accordingly.

These ranks and values were based on both the "Wilderness and Natural Areas Act of 1972" and the DNR guidelines. This quantitative system of ranking the natural features of each area was used to establish a basis for comparatively evaluating potential sites so that only the best suited sites would be designated Wild Areas and also site selection would be less subject to researcher bias.

### Orbital Imagery

Several sources of information were used in identifying potential Wild Areas. Initial sites were identified from LANDSAT imagery. Eleven LANDSAT scenes, covering the six test counties, were enlarged to a scale of 1:250,000 using a projector. General "natural areas" were identified and mapped from the enlarged images (Figs. 4-9).

The maps were prepared using both LANDSAT Band 5 and false color composites. A Band 5 image, from either late spring or summer, yielded general forested areas in each county. False color composites were then

Figure 3.--Wild Areas Criteria Grading System.

I. AREA

Number of acres in the proposed Wild Area:

|                 |           |
|-----------------|-----------|
| 80-319 acres    | 5 points  |
| 320-639 acres   | 25 points |
| 640-1279 acres  | 40 points |
| 1280-2999 acres | 50 points |

N.B. 300 acres constitutes a classification of Wilderness Area by law, and less than 80 acres is unacceptable by the DNR.

II. TOPOGRAPHY

A. Local Relief

The difference between the highest and lowest points on the site:

|                  |           |
|------------------|-----------|
| 0-49 feet        | 0 points  |
| 50-99 feet       | 15 points |
| 100-199 feet     | 30 points |
| 200-399 feet     | 35 points |
| 400-699 feet     | 40 points |
| 700 feet or more | 45 points |

B. Maximum Slope

The greatest slope (feet of rise per 100 feet of run) in the Wild Area:

|        |           |
|--------|-----------|
| 0-6%   | 0 points  |
| 6-12%  | 20 points |
| 12-18% | 40 points |
| 18+%   | 45 points |

III. SOILS

A. Predominant Drainage

The drainage class which occurs most frequently:

|                         |           |
|-------------------------|-----------|
| Poorly Drained          | 0 points  |
| Somewhat Poorly Drained | 5 points  |
| Well Drained            | 15 points |

## B. Predominant Texture

The surface texture which occupies the greatest percentage of the area:

|         |           |
|---------|-----------|
| Organic | 0 points  |
| Sand    | 5 points  |
| Clay    | 5 points  |
| Loam    | 10 points |

N.B. Loams were assigned the highest grade because they are drier than clay soils, but less droughty and erodable than sandy soils.

## IV. LANDFORM TYPES

Flexible grades were assigned here since the relief and extent of even specific geomorphic units was quite variable. Points were assigned increments of five from zero to the maximum listed next to each feature. For example, sand dunes received from 0 to 40 points depending on size, relief, and aesthetics.

### A. Glacial

|                              |           |
|------------------------------|-----------|
| Lacustrine Plain             | 0 points  |
| Outwash Plain                | 5 points  |
| Ground Moraine               | 5 points  |
| End Moraine                  | 20 points |
| Esker                        | 25 points |
| Drumlin                      | 25 points |
| Kame                         | 25 points |
| Other Stagnation<br>Features | 25 points |

### B. Fluvial

|                                 |           |
|---------------------------------|-----------|
| Floodplain                      | 0 points  |
| Delta                           | 5 points  |
| Stream Terraces                 | 15 points |
| Cliff, Bluff, Scarp             | 25 points |
| Stream Cut Valleys<br>or Gorges | 25 points |
| Other                           | 25 points |

### C. Wave Action

|                     |           |
|---------------------|-----------|
| Beach Ridges        | 5 points  |
| Spits, Sand Bars    | 5 points  |
| Bluff, Cliff, Scarp | 25 points |
| Other               | 25 points |

D. Eolian

|            |           |
|------------|-----------|
| Sand Dunes | 40 points |
| Other      | 40 points |

E. Karst

|           |           |
|-----------|-----------|
| Sinkholes | 20 points |
| Caves     | 25 points |
| Other     | 25 points |

F. Rock Outcrops 40 points

V. VEGETATION

A. Type

No points were given for this category. It was designated to simply note species and associations found in the Wild Area.

B. Composition

- % Broadleaf Forest
- % Coniferous Forest
- % Rangeland (Shrub and Grasses)

Points assigned for composition were based on the assumption that the ideal mix of vegetation consisted of 75% forested land and 25% rangeland. This percentage reflected total vegetated land only (i.e., beaches, rock outcrops not included). The procedure for point determination was as follows:

1. Sum the percentage of broadleaf and coniferous forest
2. Subtract the total percent forest from the 75% "ideal"
3. Determine the absolute value of the difference found in step 2
4. Use the following table to determine the number of points for vegetation composition:

| Absolute Value of Difference<br>from the Ideal | Points |
|------------------------------------------------|--------|
| 36 or more                                     | 0      |
| 26-35                                          | 15     |
| 16-25                                          | 30     |
| 6-15                                           | 35     |
| 5-1                                            | 40     |
| 0                                              | 50     |



C. Maturity

No points were allotted for this section. It was included to note the general age of woodlots.

VI. HYDROGRAPHY

A. Density

1. Wetlands

- a. 0-10%
- b. 11-30%
- c. 31-75%

2. Open Water and Streams

- a. less than 1%
- b. 1-40%
- c. 41-75%

Grades in this section were based on an ideal mix between wetlands, open water and streams. A combination of 0-10% wetlands and 1-40% open water and streams was considered desirable. To determine points for density and hydrographic features:

- 1. Determine % of wetlands in wild area
- 2. Determine % open water and streams in wild area
- 3. Use the matrix below to determine point score

|          |    | Open Water and Streams |    |    |
|----------|----|------------------------|----|----|
|          |    | 2a                     | 2b | 2c |
| Wetlands | 1a | 15                     | 30 | 25 |
|          | 1b | 10                     | 10 | 5  |
|          | 1c | 0                      | 5  | 0  |

B. Water Features

1. Open Water

|                 |           |
|-----------------|-----------|
| Pond (<5 acres) | 10 points |
| Lake (>5 acres) | 20 points |

2. Stream

Points were given for the average surface width of the channel.

|                          |           |
|--------------------------|-----------|
| Channel Width >50 feet   | 10 points |
| Channel Width <10 feet   | 15 points |
| Channel Width 10-50 feet | 20 points |
| 3. Swamp/Marsh           | 0 points  |
| 4. Bog                   | 10 points |
| 5. Springs               | 10 points |
| 6. Rapids                | 15 points |
| 7. Waterfalls            | 40 points |

VII. LOCATION

Distance from wild area to nearest population center of 100,000 or more persons was determined. Grades were not assigned for parts A or B of this section since they are subsumed in Part C.

A. Distance in Kilometers from Population Center to Wild Area

B. Breakdown by Surface Type

4-lane Limited Access  
4-lane Highway  
2-lane Paved  
Improved (gravel, stone)

C. Estimated Travel Time

Travel time between urban centers and wild areas was calculated from the information in both Parts A and B (distance vs. average travel speed for various road surface types).

|               |           |
|---------------|-----------|
| >60 minutes   | 0 points  |
| 45-60 minutes | 10 points |
| 30-44 minutes | 20 points |
| 15-29 minutes | 35 points |
| <15 minutes   | 50 points |

VIII. HUMAN INFLUENCE

No points were allotted for VIII and IX (see below). They added information on the aesthetic and environmental quality.

Cultural  
Historical  
Habitat Modification

IX. PERIPHERAL LAND USE

Natural Cover  
Land Use

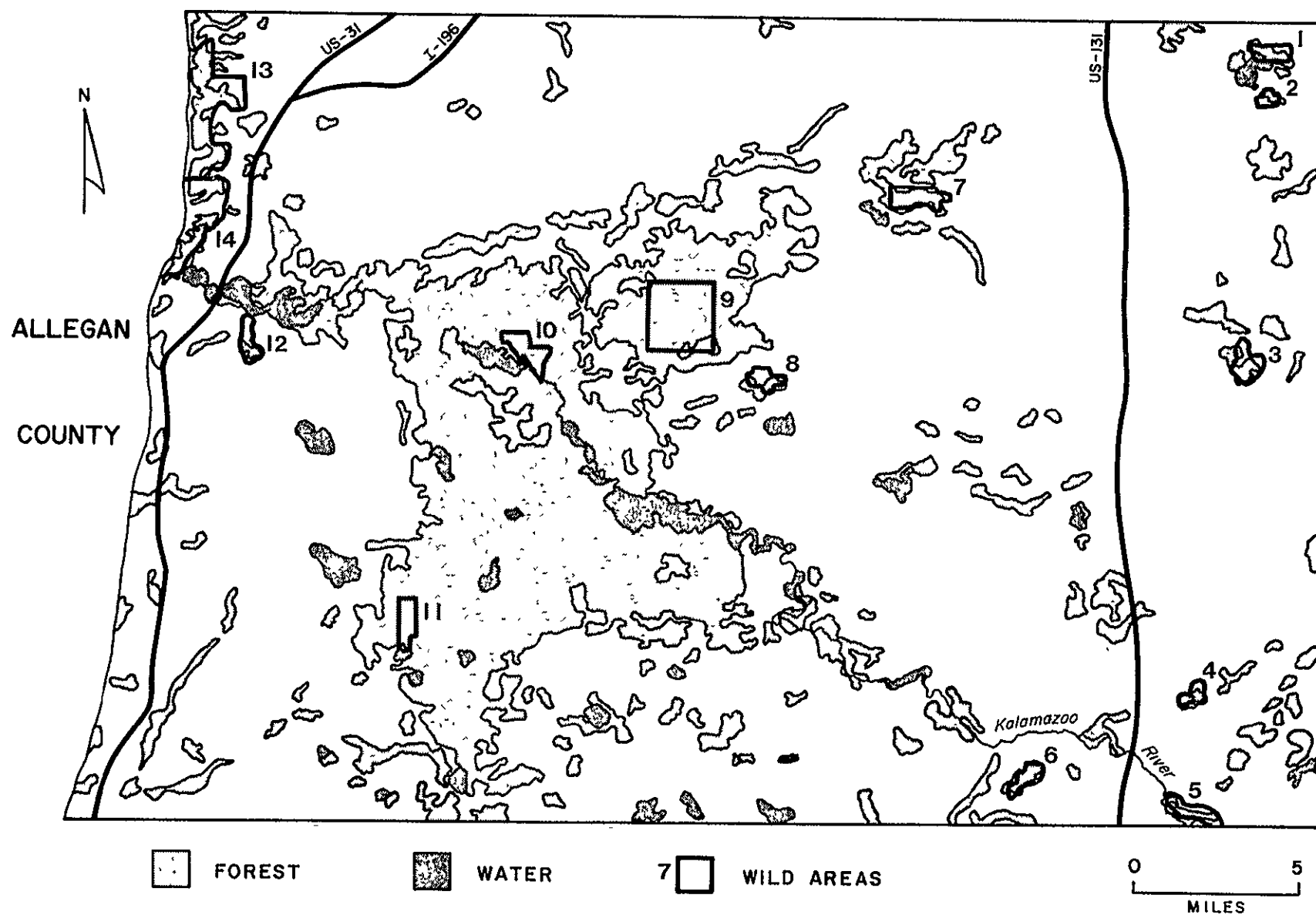


Figure 4.—LANDSAT interpretation of Forest and Water, Allegan County.

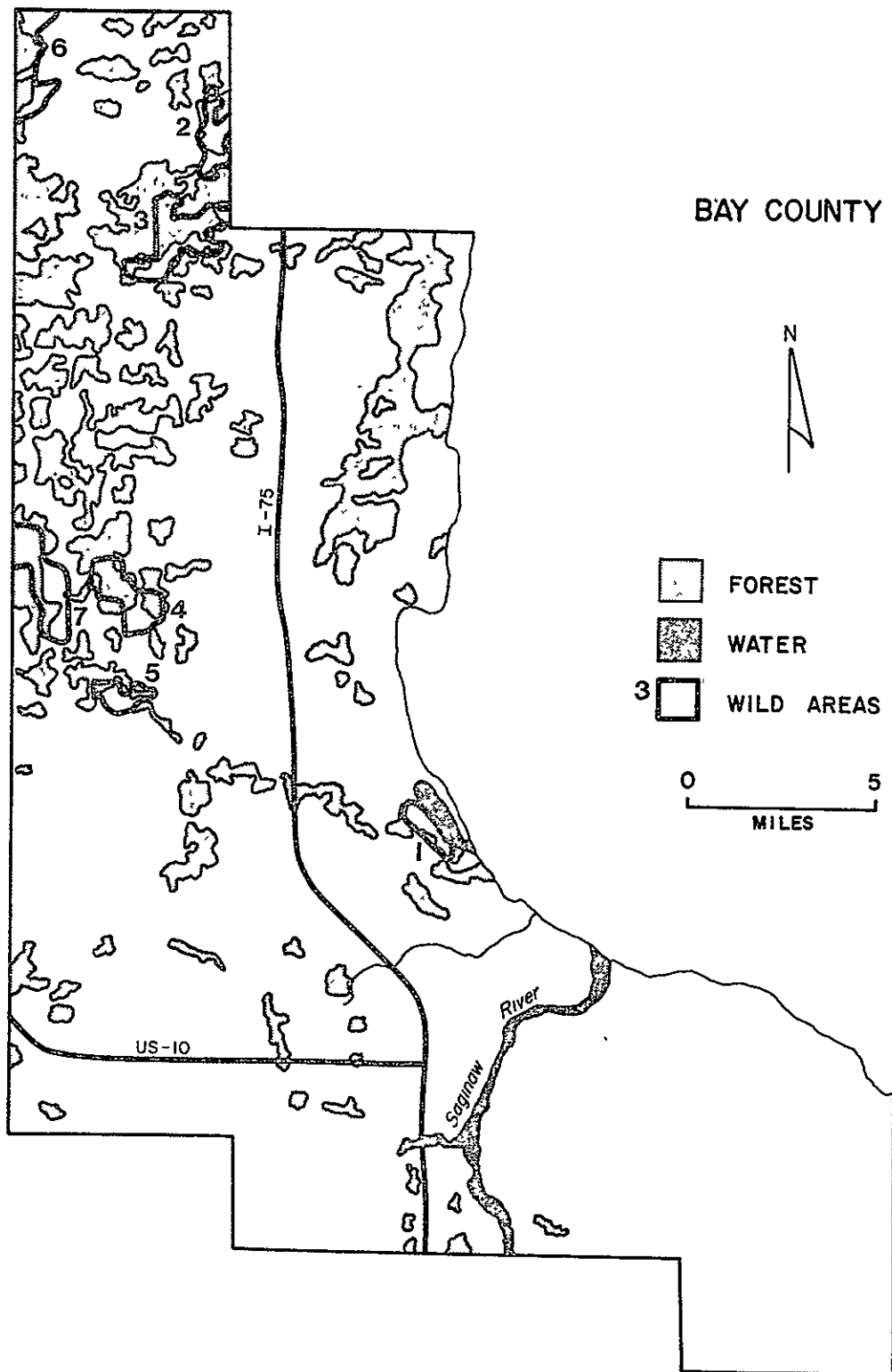
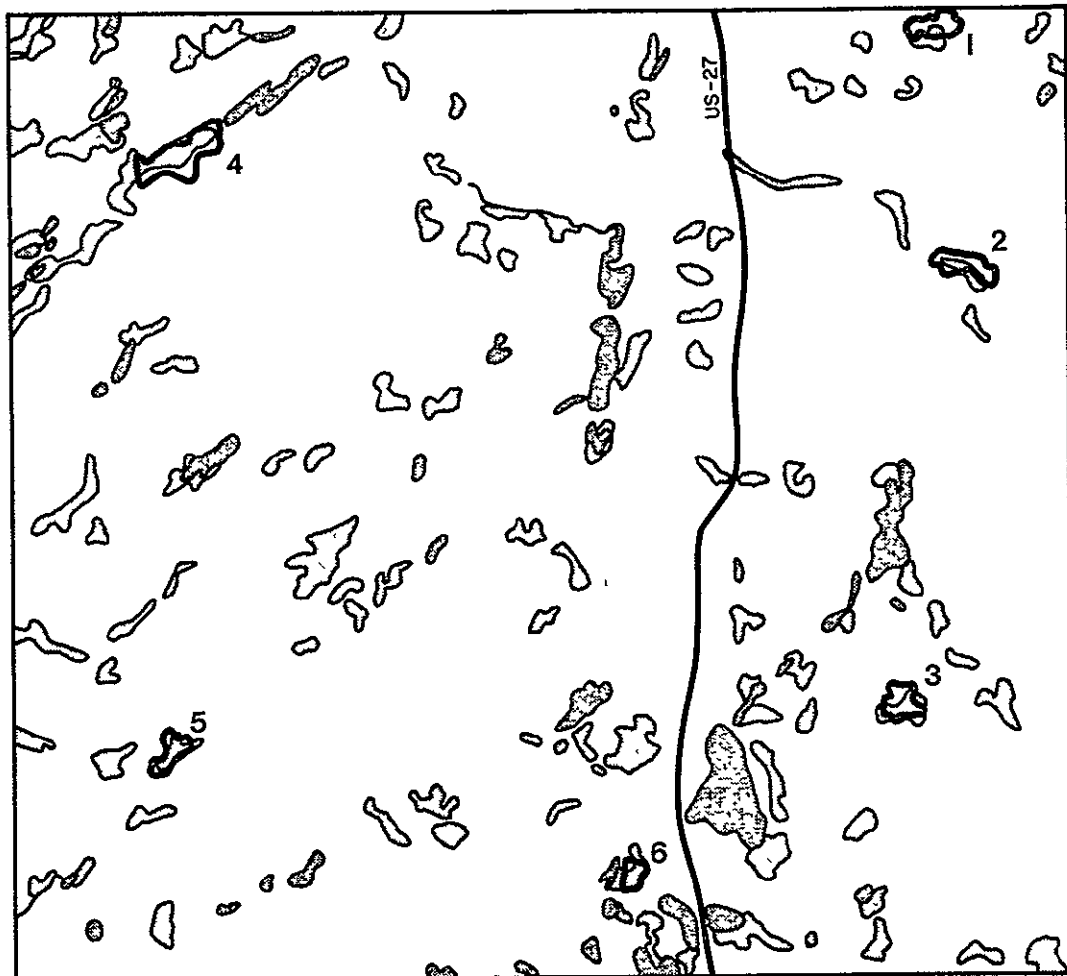


Figure 5.—LANDSAT interpretation of Forest and Water, Bay County.



BRANCH COUNTY

- ☐ FOREST
- ☒ WATER
- 6 ☐ WILD AREAS

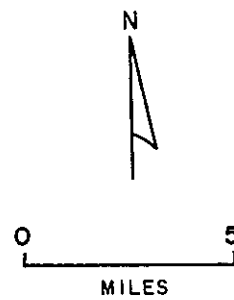


Figure 6.--LANDSAT interpretation of Forest and Water, Branch County.

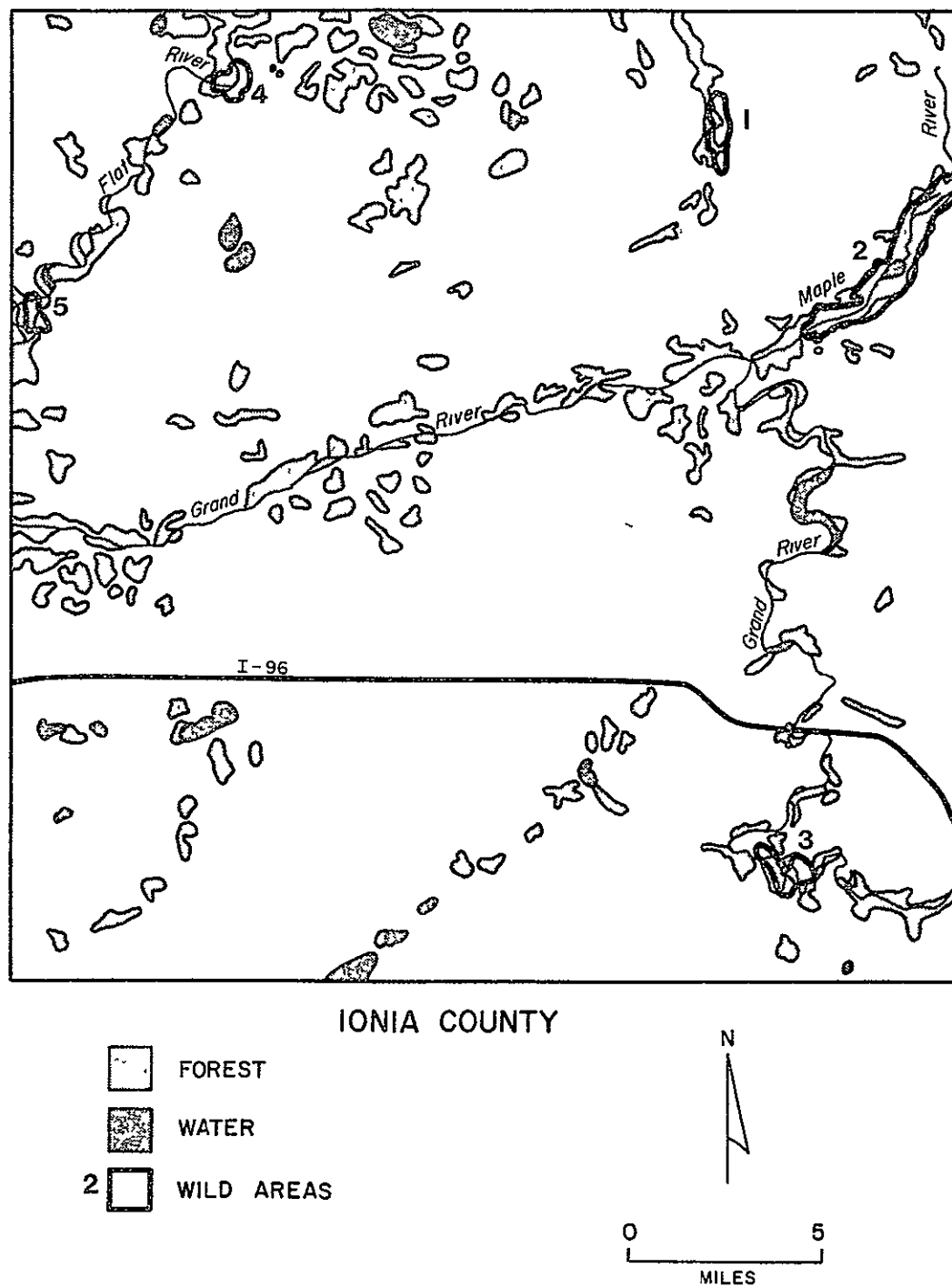


Figure 7.—LANDSAT interpretation of Forest and Water, Ionia County.

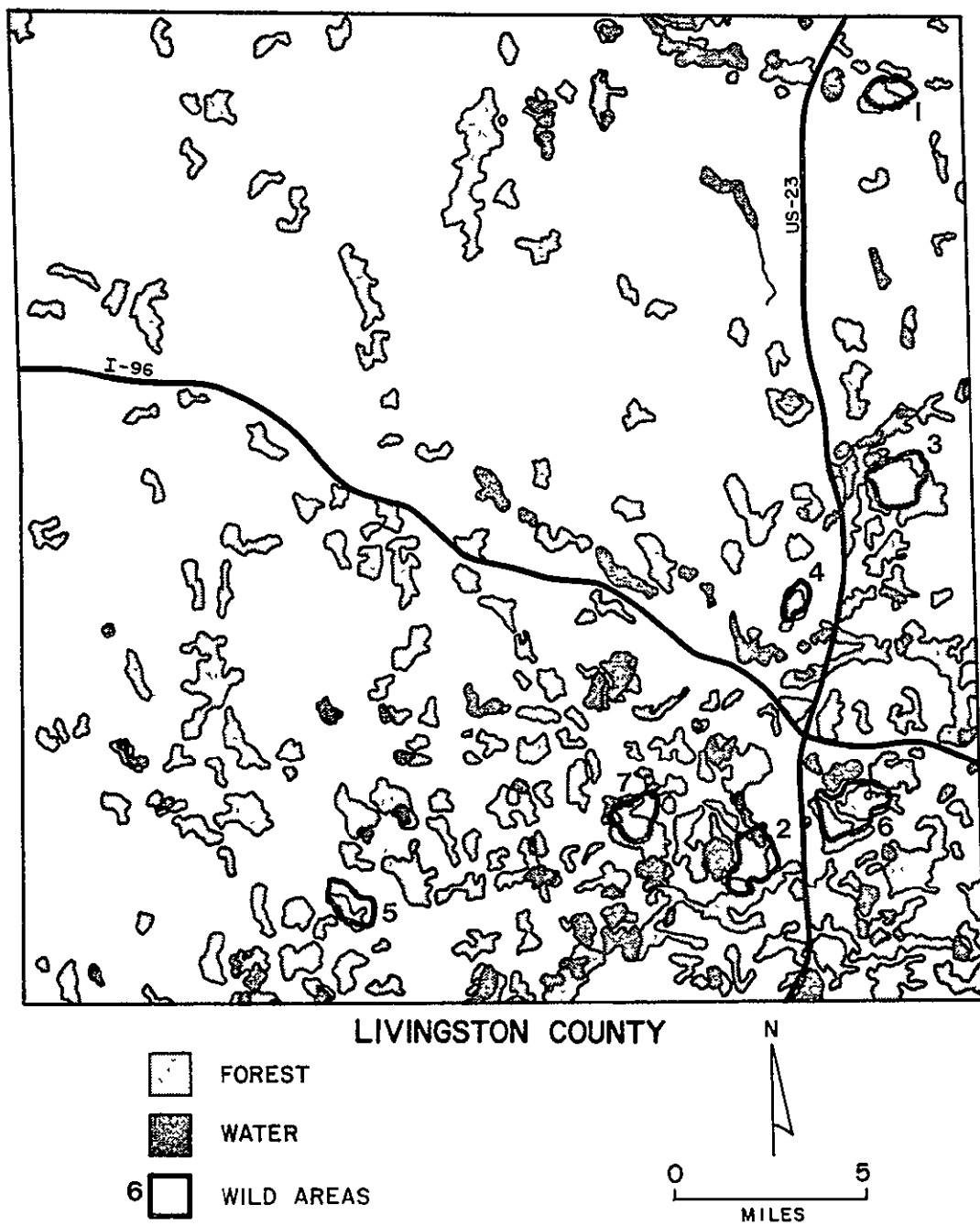


Figure 8.--LANDSAT interpretation of Forest and Water, Livingston County.



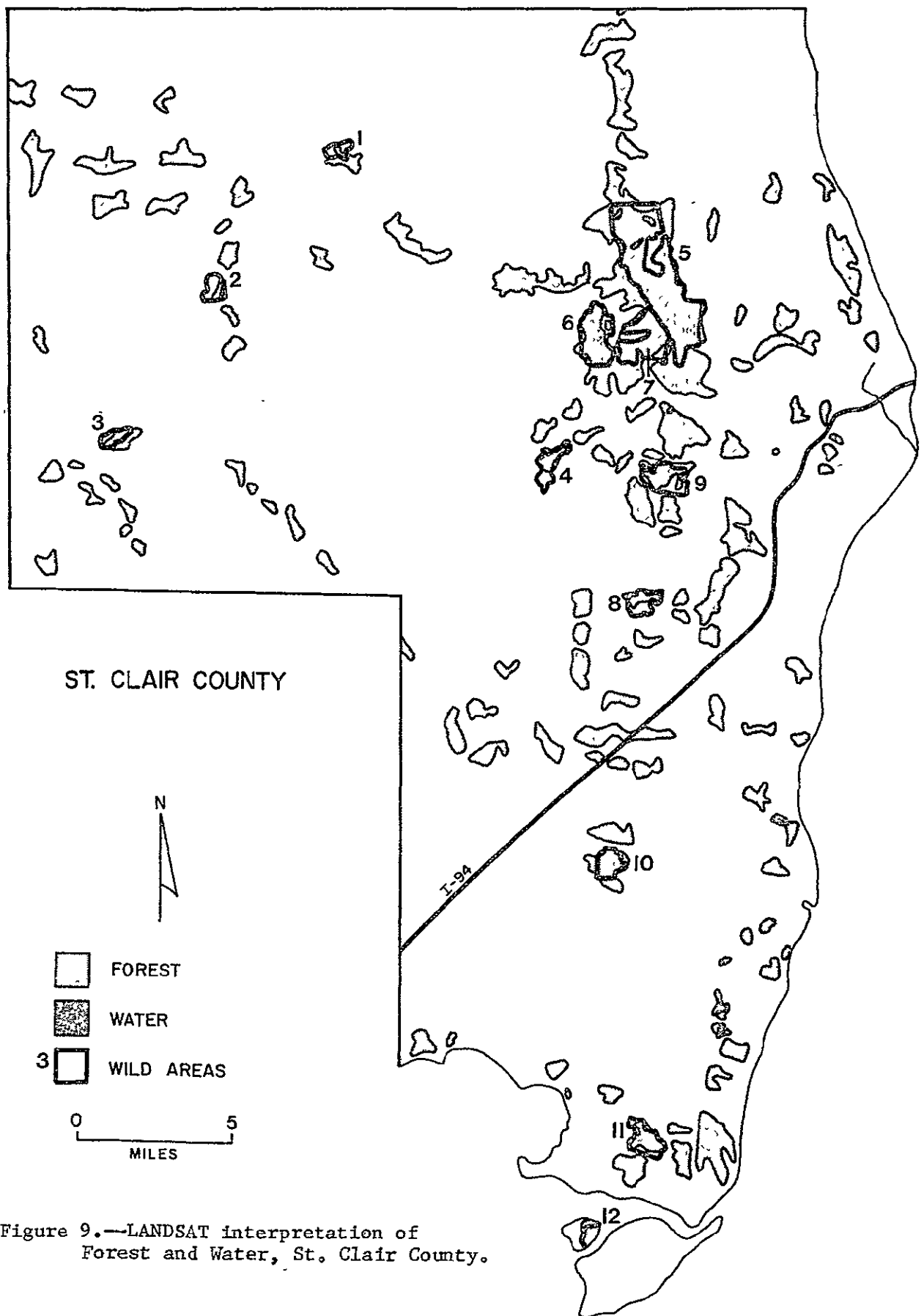


Figure 9.—LANDSAT interpretation of Forest and Water, St. Clair County.

used to delineate water bodies and rivers. These maps indicated locations warranting further, more scrutinizing evaluation. The LANDSAT scenes interpreted were:

ALLEGAN COUNTY

|                       |              |              |
|-----------------------|--------------|--------------|
| Band 5                | 15 June 1977 | E 2875-15261 |
|                       | 15 June 1977 | E 2875-15263 |
| False Color Composite | 9 June 1973  | E 1321-15584 |
|                       | 9 June 1973  | E 1321-15590 |

BAY COUNTY

|                       |             |              |
|-----------------------|-------------|--------------|
| Band 5                | 9 Sept 1976 | E 5505-15002 |
| False Color Composite | 8 June 1973 | E 1320-15525 |

BRANCH COUNTY

|                       |             |              |
|-----------------------|-------------|--------------|
| Band 5                | 27 May 1976 | E 2856-15214 |
| False Color Composite | 3 June 1973 | E 1320-15525 |

IONIA COUNTY

|                       |             |              |
|-----------------------|-------------|--------------|
| Band 5                | 8 Sept 1976 | E 5505-15002 |
| False Color Composite | 8 June 1973 | E 1320-15525 |

LIVINGSTON COUNTY

|                       |             |              |
|-----------------------|-------------|--------------|
| Band 5                | 27 May 1977 | E 2856-15212 |
|                       | 27 May 1977 | E 2856-15214 |
| False Color Composite | 8 June 1973 | E 1320-15525 |
|                       | 3 June 1974 | E 1320-15469 |

ST. CLAIR COUNTY

|                       |              |              |
|-----------------------|--------------|--------------|
| Band 5                | 20 Aug 1976  | E 5489-14561 |
| False Color Composite | 25 June 1973 | E 1337-15470 |

High-Altitude Imagery

NASA high-altitude color-infrared photography at scales of 1:120,000 and 1:60,000, and regional planning commission photography at 1:36,000 were interpreted to substantiate the initial identifications from LANDSAT imagery.

During this step in the procedure, those areas delimited on LANDSAT imagery were more closely examined to eliminate those which did not meet Wild Area criteria. Conversely, other areas which were overlooked on the orbital imagery were added to the study.

In the first stage of this interpretation, large contiguous tracts of forest, especially those adjacent to or containing water bodies, were identified. Of secondary interest were characteristics not discernable on the LANDSAT scenes such as small natural features, vegetation types, areal extent of potential sites, and the presence of commercial and residential development within and around the area. Although interpretation was concentrated on the areas that had been delineated on the LANDSAT imagery, other parts of the county were given a cursory examination.

The number of potential Wild Areas identified for each county and the total acreage for each county is shown below.

| <u>County</u> | <u>No. of Wild Area Sites</u> | <u>Total Acreage</u> |
|---------------|-------------------------------|----------------------|
| Allegan       | 14                            | 9,030                |
| Bay           | 7                             | 8,060                |
| Branch        | 6                             | 1,775                |
| Ionia         | 5                             | 2,960                |
| Livingston    | 5                             | 3,200                |
| St. Clair     | <u>12</u>                     | <u>7,300</u>         |
| Total         | 49                            | 32,325               |

#### Supplemental Information

To supplement the aerial photography and space imagery interpretations, a third source of land cover/use information was consulted. Several existing maps provided information which was difficult, if not impossible to detect from photographs (Table 1). This phase did not represent a

refinement of the previous interpretations; instead, it yielded additional information about each Wild Area. Data such as local relief, soil texture and drainage, and slope were recorded for each potential site.

Table 1.--Supplemental Information Obtained from Maps and Other Sources.

| INFORMATION SOURCE                             | FEATURE                                |
|------------------------------------------------|----------------------------------------|
| U.S. Geological Survey Topographic Maps        | Local Relief<br>Hydrographic Features  |
| Soil Conservation Service Soil Surveys         | Slope<br>Soil Drainage<br>Soil Texture |
| Map of Surface Formations of Southern Michigan | Glacial Landforms                      |
| Michigan Transportation Map                    | Distance to Population Centers         |
| Plat Maps                                      | Land Ownership                         |

#### Field Checking

Once the imagery interpretation phase was completed, a field checking procedure was initiated to: 1) assess interpretation accuracy; 2) insure that all criteria had received proper consideration; 3) verify that the grading scheme equitably measured a site's "Wild Area" desirability; and 4) provide an on-ground perspective to identify additional characteristics, such as peripheral land use, human influence, and general aesthetics. Due to time constraints, only half of the interpreted sites in each county could be visited (Table 2), so those which had the highest point totals were chosen.

Table 2.--Cumulative Point Value for Identified Wild Areas by County.  
(Note: Those underscored have been field-checked.)

| WILD AREA | ALLEGAN    | BAY        | BRANCH     | IONIA      | LIVINGSTON | ST. CLAIR  |
|-----------|------------|------------|------------|------------|------------|------------|
| 1         | <u>240</u> | 110        | <u>115</u> | 115        | <u>255</u> | <u>125</u> |
| 2         | 180        | 135        | 95         | <u>265</u> | <u>270</u> | 70         |
| 3         | <u>210</u> | <u>155</u> | 95         | <u>250</u> | 195        | 110        |
| 4         | 140        | 105        | <u>185</u> | 180        | 210        | <u>120</u> |
| 5         | 150        | <u>150</u> | 90         | <u>195</u> | 210        | <u>270</u> |
| 6         | 125        | <u>140</u> | 95         |            | <u>230</u> | <u>160</u> |
| 7         | <u>200</u> | <u>160</u> |            |            | <u>240</u> | 110        |
| 8         | <u>190</u> |            |            |            |            | 95         |
| 9         | <u>290</u> |            |            |            |            | <u>150</u> |
| 10        | 185        |            |            |            |            | 100        |
| 11        | 165        |            |            |            |            | <u>125</u> |
| 12        | 160        |            |            |            |            | 85         |
| 13        | <u>305</u> |            |            |            |            |            |
| 14        | <u>290</u> |            |            |            |            |            |

Field checking involved viewing the perimeter of the area to note both off- and on-site activities and whenever accessible, the interior of the area was examined, although time limitations did not allow a thorough check of every site. Specific dimensions and features not identifiable on the photography were examined, such as general forest age, density, and composition, water quality and wildlife indicators. Physical characteristics of each site and general descriptions and maps of the field-checked sites can be found in Appendix A.

Since no more than four areas per county were to be recommended for consideration, it was at this stage that excess sites in Allegan and St.

Clair Counties were eliminated. Table 3 lists the number of Wild Areas interpreted, field-checked and later recommended by the Remote Sensing Project to the Department of Natural Resources. The Wild Area sites recommended are given in Table 4.

Table 3.--Total Number of Wild Areas Identified, Field-Checked and Recommended by County.

| COUNTY     | No. of Wild Area Sites<br>Interpreted from<br>Aerial Imagery | No. of Wild Area<br>Sites Field-<br>Checked | No. of Sites Recom-<br>mended for Wild<br>Area Consideration |
|------------|--------------------------------------------------------------|---------------------------------------------|--------------------------------------------------------------|
| Allegan    | 14                                                           | 7                                           | 4                                                            |
| Bay        | 7                                                            | 4                                           | 4                                                            |
| Branch     | 6                                                            | 3                                           | 3                                                            |
| Ionia      | 5                                                            | 3                                           | 3                                                            |
| Livingston | 7                                                            | 4                                           | 4                                                            |
| St. Clair  | 12                                                           | 6                                           | 4                                                            |
| TOTAL      | 51                                                           | 27                                          | 22                                                           |

Table 4.--Wild Area Sites Recommended for DNR Consideration.

| COUNTY     | SITE NUMBER |   |    |    |
|------------|-------------|---|----|----|
| Allegan    | 3           | 9 | 13 | 14 |
| Bay        | 3           | 5 | 6  | 7  |
| Branch     | 1           | 4 | 6  |    |
| Ionia      | 2           | 3 | 5  |    |
| Livingston | 1           | 2 | 6  | 7  |
| St. Clair  | 4           | 5 | 9  | 11 |

## REFERENCES

- Anderson, Paul F. and Glenn H. Beavers. 1976. Reconnaissance Level Identification of Potential Natural Resource Critical Areas. Land Use Analysis Laboratory. Iowa State University.
- Bosselman, F. and D. Callies. 1971. The Quiet Revolution in Land Use Control. Council on Environmental Quality. Washington, D.C.
- Enslin, William R. and Richard Hill-Rowley. 1977. Guide to Aerial Imagery of Michigan. Michigan State University Agricultural Experiment Station. East Lansing, Michigan.
- Hudson, Dennis, Robert J. Amsterburg Jr., and Wayne Myers. 1976. Identifying and Mapping Forest Resources from Small-Scale Color-Infrared Airphotos. Michigan State University Agricultural Experiment Station. East Lansing, Michigan.
- Pawling, John W. 1969. Morphometric Analysis of the Southern Peninsula of Michigan. Department of Geography, Ph.D. thesis, Michigan State University.
- Way, Douglas S. 1973. Terrain Analysis. Dowden, Hutchinson & Ross, Inc. Stroudsburg, Pennsylvania.

## APPENDIX A.



Table A1.--Physical Characteristics of Wild Areas--Allegan County.

|                                  |                           |
|----------------------------------|---------------------------|
| WILD AREA: 1                     | COUNTY: Allegan           |
| AREA: 200 acres                  | VEGETATION COMPOSITION:   |
| LOCAL RELIEF: 80 feet            | BROADLEAVED: 90%          |
| SLOPE: 18+%                      | CONIFEROUS: 0%            |
| SOIL DRAINAGE: Well Drained      | RANGELAND: 10%            |
| SOIL TEXTURE: Loam               | HYDROGRAPHY:              |
| LANDFORMS:                       | WETLAND DENSITY: 0-10%    |
| End Moraine                      | OPEN WATER DENSITY: 1-40% |
|                                  | FEATURES: Pond<br>Lake    |
| LOCATION:                        |                           |
| DISTANCE TO: 24 mi Grand Rapids  |                           |
| APPROX. DRIVING TIME: 25 minutes |                           |

|                                  |                         |
|----------------------------------|-------------------------|
| WILD AREA: 2                     | COUNTY: Allegan         |
| AREA: 150 acres                  | VEGETATION COMPOSITION: |
| LOCAL RELIEF: 20 feet            | BROADLEAVED: 88%        |
| SLOPE: 18+%                      | CONIFEROUS: 0%          |
| SOIL DRAINAGE: Well Drained      | RANGELAND: 12%          |
| SOIL TEXTURE: Loam               | HYDROGRAPHY:            |
| LANDFORMS:                       | WETLAND DENSITY: 0-10%  |
| End Moraine<br>Outwash Plain     | OPEN WATER DENSITY: <1% |
|                                  | FEATURES: Pond          |
| LOCATION:                        |                         |
| DISTANCE: 24 mi Grand Rapids     |                         |
| APPROX. DRIVING TIME: 26 minutes |                         |

WILD AREA: 3

COUNTY: Allegan

AREA: 350 acres

VEGETATION COMPOSITION:

LOCAL RELIEF: 40 feet

BROADLEAVED: 90%

SLOPE: 12-18%

CONIFEROUS: 0%

SOIL DRAINAGE: Well Drained

RANGELAND: 10%

SOIL TEXTURE: Sand

HYDROGRAPHY:

LANDFORMS:

WETLAND DENSITY: 0-10%

Outwash Plain

OPEN WATER DENSITY: 1-40%

FEATURES: Lake

LOCATION:

DISTANCE TO: 28 mi Grand Rapids

APPROX. DRIVING TIME: 29 minutes

WILD AREA: 4

COUNTY: Allegan

AREA: 120 acres

VEGETATION COMPOSITION:

LOCAL RELIEF: 10 feet

BROADLEAVED: 98%

SLOPE: 0-6%

CONIFEROUS: 0%

SOIL DRAINAGE: Somewhat Poorly  
Drained

RANGELAND: 2%

SOIL TEXTURE: Loam

HYDROGRAPHY:

LANDFORMS:

WETLAND DENSITY: 0-10%

Outwash Plain

OPEN WATER DENSITY: 1-40%

Lacustrine Plain

Floodplain

FEATURES: Stream 10'-50' wide

LOCATION:

DISTANCE: 17 mi Kalamazoo

APPROX. DRIVING TIME: 18 minutes

WILD AREA: '5

COUNTY: Allegan

AREA: 230 acres

VEGETATION COMPOSITION:

LOCAL RELIEF: 10 feet

BROADLEAVED: 85%

SLOPE: 0-6%

CONIFEROUS: 0%

SOIL DRAINAGE: Well Drained

RANGELAND: 15%

SOIL TEXTURE: Loam

HYDROGRAPHY:

LANDFORMS:

WETLAND DENSITY: 11-30%

Lacustrine Plain  
Floodplain

OPEN WATER DENSITY: 1-40%

FEATURES: Stream >50'wide  
Rapids

LOCATION:

DISTANCE TO: 12 mi Kalamazoo

APPROX. DRIVING TIME: 14 minutes

WILD AREA: 6

COUNTY: Allegan

AREA: 250 acres

VEGETATION COMPOSITION:

LOCAL RELIEF: 10 feet

BROADLEAVED: 85%

SLOPE: 0-6%

CONIFEROUS: 0%

SOIL DRAINAGE: Well Drained

RANGELAND: 15%

SOIL TEXTURE: Loam

HYDROGRAPHY:

LANDFORMS:

WETLAND DENSITY: 0-10%

Lacustrine Plain

OPEN WATER DENSITY: <1%

FEATURES: Pond

LOCATION:

DISTANCE: 17 mi Kalamazoo

APPROX. DRIVING TIME: 19 minutes

|                                |                               |
|--------------------------------|-------------------------------|
| WILD AREA: 7                   | COUNTY: Allegan               |
| AREA: 600 acres                | VEGETATION COMPOSITION:       |
| LOCAL RELIEF: 40 feet          | BROADLEAVED: 74%              |
| SLOPE: 6-12%                   | CONIFEROUS: 1%                |
| SOIL DRAINAGE: Well Drained    | RANGELAND: 25%                |
| SOIL TEXTURE: Sand             | HYDROGRAPHY:                  |
| LANDFORMS:                     | WETLAND DENSITY: 0-10%        |
| Lacustrine Plain<br>Floodplain | OPEN WATER DENSITY: 1-40%     |
|                                | FEATURES: Stream 10'-50' wide |

LOCATION:

DISTANCE TO: 24 mi Grand Rapids  
APPROX. DRIVING TIME: 26 minutes

|                             |                           |
|-----------------------------|---------------------------|
| WILD AREA: 8                | COUNTY: Allegan           |
| AREA: 320 acres             | VEGETATION COMPOSITION:   |
| LOCAL RELIEF: 40 feet       | BROADLEAVED: 65%          |
| SLOPE: 6-12%                | CONIFEROUS: 0%            |
| SOIL DRAINAGE: Well Drained | RANGELAND: 35%            |
| SOIL TEXTURE: Sand          | HYDROGRAPHY:              |
| LANDFORMS:                  | WETLAND DENSITY: 0-10%    |
| End Moraine                 | OPEN WATER DENSITY: 1-40% |
|                             | FEATURES: Lake            |

LOCATION:

DISTANCE: 35 mi Grand Rapids  
APPROX. DRIVING TIME: 39 minutes

WILD AREA: 9' COUNTY: Allegan  
AREA: 2560 acres VEGETATION COMPOSITION:  
LOCAL RELIEF: 120 feet BROADLEAVED: 75%  
SLOPE: 12-18% CONIFEROUS: 8%  
SOIL DRAINAGE: Well Drained RANGELAND: 17%  
SOIL TEXTURE: Sand HYDROGRAPHY:  
LANDFORMS: WETLAND DENSITY: 0-10%  
End Moraine OPEN WATER DENSITY: 1-40%  
Floodplain  
FEATURES: Pond  
Lake  
Stream <10' wide  
Swamp/Marsh  
LOCATION:  
DISTANCE TO: 37 mi Grand Rapids  
APPROX. DRIVING TIME: 40 minutes

WILD AREA: 10 COUNTY: Allegan  
AREA: 550 acres VEGETATION COMPOSITION:  
LOCAL RELIEF: 80 feet BROADLEAVED: 95%  
SLOPE: 18+% CONIFEROUS: 0%  
SOIL DRAINAGE: Well Drained RANGELAND: 5%  
SOIL TEXTURE: Sand HYDROGRAPHY:  
LANDFORMS: WETLAND DENSITY: 11-30%  
Lacustrine Plain OPEN WATER DENSITY: 1-40%  
Floodplain  
Cliff  
FEATURES: Stream >50' wide  
Swamp/Marsh  
LOCATION:  
DISTANCE: 42 mi Kalamazoo  
APPROX. DRIVING TIME: 46 minutes

|                             |                           |
|-----------------------------|---------------------------|
| WILD AREA: 11               | COUNTY: Allegan           |
| AREA: 400 acres             | VEGETATION COMPOSITION:   |
| LOCAL RELIEF: 40 feet       | BROADLEAVED: 97%          |
| SLOPE: 6-12%                | CONIFEROUS: 2%            |
| SOIL DRAINAGE: Well Drained | RANGELAND: 1%             |
| SOIL TEXTURE: Sand          | HYDROGRAPHY:              |
| LANDFORMS:                  | WETLAND DENSITY: 0-10%    |
| Lacustrine Plain            | OPEN WATER DENSITY: 1-40% |
|                             | FEATURES: Lake            |

LOCATION:

DISTANCE TO: 37 mi Kalamazoo  
APPROX. DRIVING TIME: 41 minutes

|                                           |                            |
|-------------------------------------------|----------------------------|
| WILD AREA: 12                             | COUNTY: Allegan            |
| AREA: 150 acres                           | VEGETATION COMPOSITION:    |
| LOCAL RELIEF: 50 feet                     | BROADLEAVED: 92%           |
| SLOPE: 12-18%                             | CONIFEROUS: 0%             |
| SOIL DRAINAGE: Somewhat Poorly<br>Drained | RANGELAND: 8%              |
| SOIL TEXTURE: Sand                        | HYDROGRAPHY:               |
| LANDFORMS:                                | WETLAND DENSITY: 0-10%     |
| Ground Moraine                            | OPEN WATER DENSITY: <1%    |
| Lacustrine Plain                          | FEATURES: Stream <10' side |
| Stream Valley                             |                            |

LOCATION:

DISTANCE: 42 mi Grand Rapids  
APPROX. DRIVING TIME: 44 minutes

WILD AREA: 13 COUNTY: Allegan  
AREA: 1650 acres VEGETATION COMPOSITION:  
LOCAL RELIEF: 235 feet BROADLEAVED: 70%  
SLOPE: 18+ CONIFEROUS: 15%  
SOIL DRAINAGE: Well Drained RANGELAND: 15%  
SOIL TEXTURE: Sand HYDROGRAPHY:  
LANDFORMS: WETLAND DENSITY: 0-10%  
Lacustrine Plain OPEN WATER DENSITY: 1-40%  
Sand Dunes FEATURES: Pond  
Lake  
LOCATION:  
DISTANCE TO: 35 mi Grand Rapids  
APPROX. DRIVING TIME: 38 minutes

WILD AREA: 14 COUNTY: Allegan  
AREA: 1500 acres VEGETATION COMPOSITION:  
LOCAL RELIEF: 220 feet BROADLEAVED: 87%  
SLOPE: 18+% CONIFEROUS: 8%  
SOIL DRAINAGE: Well Drained RANGELAND: 5%  
SOIL TEXTURE: Sand HYDROGRAPHY:  
LANDFORMS: WETLAND DENSITY: 11-30%  
Lacustrine Plain OPEN WATER DENSITY: 1-40%  
Sand Dunes  
FEATURES: Pond  
Lake  
Stream >50' wide  
LOCATION:  
DISTANCE: 39 mi Grand Rapids  
APPROX. DRIVING TIME: 41 minutes

ALLEGAN COUNTY

All the land in four of the potential Wild Areas visited in Allegan County--1, 3, 7, and 8--is privately owned. Low relief and mature deciduous forests characterize these sites, which include either lakes or streams.

Wild Area 1, which is in the northeast corner of the county, is at the eastern end of Green Lake. Accessibility to the site was difficult, so the field check was incomplete. To the south and east of the site, agriculture was slowly changing to residential use, but to the north only agriculture and tree fruits were observed. Residential development, including a trailer park, is abundant at the western end of the Wild Area along the lake.

Both Mill and Boot Lakes are in Wild Area 3 in east central Allegan County. There are openings and trails in the forest, as well as signs of selective cutting. Boot Lake offers suitable habitat for waterfowl since it is shallow, surrounded by marshy vegetation, and close to the Allegan State Game Preserve. The land cover adjacent to the site includes agriculture, open fields and low density residential development.

Wild Area 7 is a rectangular plot along both sides of the Rabbit River in the northern part of the county. Because it is nearly flat, some lower spots flood in the spring. Some rangeland is mixed with the forest. Agriculture, forest, open fields, brush, a Christmas tree farm, and a private recreation area surround the potential Wild Area.

Wild Area 8 in central Allegan County consists principally of large tracts of privately owned flat land. There is residential development along



the southern end of Spec Lake, but the peripheral land use elsewhere is rolling farmland, brush, open fields, forest and a tree farm.

At Wild Area 9 the scenery changes. Forests and open fields surround the four square miles within the Allegan State Game Area which make up the Wild Area, so all but 245 acres are state owned. Vegetation here is more diverse than at the previous four sites, and a 100' hill to the northwest, where a fire tower stood, is the most perceptible relief; at its base, the remains of the ranger's cabin add an aura of antiquity.

Wild Areas 13 and 14 are located along Lake Michigan in northern Allegan County, and are dominated by a series of dune complexes with local relief up to 235'. Three-quarters of Wild Area 13 is privately owned as is most of Wild Area 14. At both, the vegetation consists of dune forests and grasses with sandy openings. At Wild Area 13, the larger of the two sites, two lakes are nestled among the dunes. At the center of the site is a township park where a panoramic view is offered at the top of its dunes. Low density residential development is interspersed with the forest, brush and open areas adjacent to the area.

Just to the south, Wild Area 14 is both ringed by and intruded upon by development from nearby Saugatuck and Douglas. A dune ride, which is available in the Wild Area, would show a mix of deciduous and coniferous trees, rangeland and open sandy areas similar to its northern component. Both the state of Michigan and the village of Saugatuck own small sections of the site.

Table A2.--Physical Characteristics of Wild Areas--Bay County.

|                                           |                         |
|-------------------------------------------|-------------------------|
| WILD AREA: 1                              | COUNTY: Bay             |
| AREA: 520 acres                           | VEGETATION COMPOSITION: |
| LOCAL RELIEF: 10 feet                     | BROADLEAVED: 98%        |
| SLOPE: 0-6%                               | CONIFEROUS: 0%          |
| SOIL DRAINAGE: Somewhat Poorly<br>Drained | RANGELAND: 2%           |
| SOIL TEXTURE: Sand                        | HYDROGRAPHY:            |
| LANDFORMS:                                | WETLAND DENSITY: 11-30% |
| Lacustrine Plain                          | OPEN WATER DENSITY: <1% |
| Beach Ridges                              | FEATURES: Swamp/Marsh   |

LOCATION:

DISTANCE TO: 20 mi Saginaw

APPROX. DRIVING TIME: 22 minutes

|                                           |                                           |
|-------------------------------------------|-------------------------------------------|
| WILD AREA: 2                              | COUNTY: Bay                               |
| AREA: 960 acres                           | VEGETATION COMPOSITION:                   |
| LOCAL RELIEF: 25 feet                     | BROADLEAVED: 92%                          |
| SLOPE: 0-6%                               | CONIFEROUS: 0%                            |
| SOIL DRAINAGE: Somewhat Poorly<br>Drained | RANGELAND: 8%                             |
| SOIL TEXTURE: Loam                        | HYDROGRAPHY:                              |
| LANDFORMS:                                | WETLAND DENSITY: 0-10%                    |
| Lacustrine Plain                          | OPEN WATER DENSITY: <1%                   |
|                                           | FEATURES: Stream <10' wide<br>Swamp/Marsh |

LOCATION:

DISTANCE: 39 mi Saginaw

APPROX. DRIVING TIME: 42 minutes

WILD AREA: 3

COUNTY: Bay

AREA: 1900 acres

VEGETATION COMPOSITION:

LOCAL RELIEF: 45 feet

BROADLEAVED: 94%

SLOPE: 0-6%

CONIFEROUS: 1%

SOIL DRAINAGE: Somewhat Poorly  
Drained

RANGELAND: 5%

SOIL TEXTURE: Loam

HYDROGRAPHY:

LANDFORMS:

WETLAND DENSITY: 0-10%

Lacustrine Plain  
Floodplain  
Small Dunes

OPEN WATER DENSITY: <1%

FEATURES: Stream <10' wide  
Swamp/Marsh

LOCATION:

DISTANCE TO: 40 mi Saginaw

APPROX. DRIVING TIME: 43 minutes

WILD AREA: 4

COUNTY: Bay

AREA: 1000 acres

VEGETATION COMPOSITION:

LOCAL RELIEF: 15 feet

BROADLEAVED: 95%

SLOPE: 0-6%

CONIFEROUS: 0%

SOIL DRAINAGE: Poorly Drained

RANGELAND: 5%

SOIL TEXTURE: Sand

HYDROGRAPHY:

LANDFORMS:

WETLAND DENSITY: 11-30%

Lacustrine Plain

OPEN WATER DENSITY: <1%

FEATURES: Swamp/Marsh

LOCATION:

DISTANCE: 28 mi Saginaw

APPROX. DRIVING TIME: 30 minutes

WILD AREA: 5

COUNTY: Bay

AREA: 500 acres

VEGETATION COMPOSITION:

LOCAL RELIEF: 10 feet

BROADLEAVED: 88%

SLOPE: 0-6%

CONIFEROUS: 0%

SOIL DRAINAGE: Poorly Drained

RANGELAND: 12%

SOIL TEXTURE: Sand

### HYDROGRAPHY:

LANDFORMS:

WETLAND DENSITY: 0-10%

Lacustrine Plain  
Floodplain

OPEN WATER DENSITY: 1-40%

FEATURES: Stream 10'-50' wide  
Swamp/Marsh

LOCATION:

DISTANCE TO: 27 mi Saginaw

APPROX. DRIVING TIME: 29 minutes

WILD AREA: 6

COUNTY: Bay

AREA: 1280 acres

VEGETATION COMPOSITION:

LOCAL RELIEF: 75 feet

BROADLEAVED: 93%

SLOPE: 6-12%

CONIFEROUS: 0%

SOIL DRAINAGE: Poorly Drained

RANGELAND: 7%

SOIL TEXTURE: Sand

HYDROGRAPHY:

LANDFORMS:

WETLAND DENSITY: 11-30%

Lacustrine Plain

OPEN WATER DENSITY: <1%

FEATURES: Swamp/Marsh

LOCATION:

DISTANCE: 47 mi Saginaw

APPROX. DRIVING TIME: 51 minutes

WILD AREA: 7

COUNTY: Bay

AREA: 1700 acres

VEGETATION COMPOSITION:

LOCAL RELIEF: 30 feet

BROADLEAVED: 90%

SLOPE: 0-6%

CONIFEROUS: 0%

SOIL DRAINAGE: Somewhat Poorly  
Drained

RANGELAND: 10%

SOIL TEXTURE: Loam

HYDROGRAPHY:

LANDFORMS:

WETLAND DENSITY: 11-30%

Lacustrine Plain  
Floodplain  
Small Dunes

OPEN WATER DENSITY: 1-40%

FEATURES: Stream 10'-50' wide  
Swamp/Marsh

LOCATION:

DISTANCE TO: 31 mi Saginaw

APPROX. DRIVING TIME: 33 minutes

BAY COUNTY

All four of the Wild Areas visited in Bay County are privately owned and largely forest covered, with birch a predominant component. Although the sites are distributed over a large area in the county, the topography offers little relief from the vast lake plain which fringes Saginaw Bay.

To the north, the Saganing Creek flows through Wild Area 3. The deciduous forest here is mixed in age, and both forested and agricultural land surrounds this large site.

Wild Area 5 in central Bay County trends along the North Branch of the Kawkawlin River. The forest here is mature and is a habitat for the many birds seen in and around the area. Peripheral land use consists of farms, woodland, brush, low density residential, and open lands.

Adjacent to Arenac and Gladwin Counties in northwestern Bay County some small beach ridges interrupt the lake plain in Wild Area 6. In addition to the predominately birch forest are both brushy and open areas; this vegetative diversity hosts numerous birds, including herons. Abutting this potential Wild Area is more forestland, rolling farmland, brush and open areas.

South of Wild Area 6, Wild Area 7 borders Midland County and is cut by the North Branch of the Kawkawlin River. Not only are there beach ridges here, but also some interior sand dunes. Like the other Bay County sites, it is generally wooded, though a section to the south has been logged. Outside of the Wild Area, most of the land is farmed or in forest but there is also a gun club which overlaps the site, and an excavating operation.

Table A3.--Physical Characteristics of Wild Areas--Branch County.

|                                  |                         |
|----------------------------------|-------------------------|
| WILD AREA: 1                     | COUNTY: Branch          |
| AREA: 320 acres                  | VEGETATION COMPOSITION: |
| LOCAL RELIEF: 60 feet            | BROADLEAVED: 85%        |
| SLOPE: 0-6%                      | CONIFEROUS: 0%          |
| SOIL DRAINAGE: Poorly Drained    | RANGELAND: 15%          |
| SOIL TEXTURE: Organic            | HYDROGRAPHY:            |
| LANDFORMS:                       | WETLAND DENSITY: 0-10%  |
| Outwash Plain                    | OPEN WATER DENSITY: <1% |
| End Moraine                      | FEATURES:               |
| LOCATION:                        |                         |
| DISTANCE TO: 58 mi Kalamazoo     |                         |
| APPROX. DRIVING TIME: 61 minutes |                         |

|                                  |                               |
|----------------------------------|-------------------------------|
| WILD AREA: 2                     | COUNTY: Branch                |
| AREA: 220 acres                  | VEGETATION COMPOSITION:       |
| LOCAL RELIEF: 40 feet            | BROADLEAVED: 85%              |
| SLOPE: 0-6%                      | CONIFEROUS: 0%                |
| SOIL DRAINAGE: Poorly Drained    | RANGELAND: 15%                |
| SOIL TEXTURE: Loam               | HYDROGRAPHY:                  |
| LANDFORMS:                       | WETLAND DENSITY: 0-10%        |
| Outwash Plain                    | OPEN WATER DENSITY: 1-40%     |
| Flood Plain                      | FEATURES: Stream 10'-50' wide |
| LOCATION:                        |                               |
| DISTANCE: 62 mi Kalamazoo        |                               |
| APPROX. DRIVING TIME: 67 minutes |                               |

|                               |                         |
|-------------------------------|-------------------------|
| WILD AREA: 3                  | COUNTY: Branch          |
| AREA: 340 acres               | VEGETATION COMPOSITION: |
| LOCAL RELIEF: 10 feet         | BROADLEAVED: 70%        |
| SLOPE: 0-6%                   | CONIFEROUS: 0%          |
| SOIL DRAINAGE: Poorly Drained | RANGELAND: 30%          |
| SOIL TEXTURE: Loam            | HYDROGRAPHY:            |
| LANDFORMS:                    | WETLAND DENSITY: 0-10%  |
| Ground Moraine                | OPEN WATER DENSITY: <1% |
|                               | FEATURES: Swamp/March   |

LOCATION:

DISTANCE TO: 66 mi Kalamazoo  
APPROX. DRIVING TIME: 1 hr 13 min

|                               |                            |
|-------------------------------|----------------------------|
| WILD AREA: 4                  | COUNTY: Branch             |
| AREA: 560 acres               | VEGETATION COMPOSITION:    |
| LOCAL RELIEF: 60 feet         | BROADLEAVED: 90%           |
| SLOPE: 6-12%                  | CONIFEROUS: 0%             |
| SOIL DRAINAGE: Poorly Drained | RANGELAND: 10%             |
| SOIL TEXTURE: Loam            | HYDROGRAPHY:               |
| LANDFORMS:                    | WETLAND DENSITY: 0-10%     |
| Outwash Plain                 | OPEN WATER DENSITY: 1-40%  |
| Stream Valley                 | FEATURES: Stream >50' wide |

LOCATION:

DISTANCE: 39 mi Kalamazoo  
APPROX. DRIVING TIME: 42 minutes



WILD AREA: 5

COUNTY: Branch

AREA: 160 acres

VEGETATION COMPOSITION:

LOCAL RELIEF: 0-60%

BROADLEAVED: 90%

SLOPE: 0-6%

CONIFEROUS: 0%

SOIL DRAINAGE: Poorly Drained

RANGELAND: 10%

SOIL TEXTURE: Organic

HYDROGRAPHY:

LANDFORMS:

WETLAND DENSITY: 0-10%

Outwash Plain

OPEN WATER DENSITY: 1-40%

FEATURES: Stream <10' wide

LOCATION:

DISTANCE TO: 58 mi Kalamazoo

APPROX. DRIVING TIME: 64 minutes

WILD AREA: 6

COUNTY: Branch

AREA: 175 acres

VEGETATION COMPOSITION:

LOCAL RELIEF: 20 feet

BROADLEAVED: 95%

SLOPE: 0-6%

CONIFEROUS: 0%

SOIL DRAINAGE: Poorly Drained

RANGELAND: 5%

SOIL TEXTURE: Organic

HYDROGRAPHY:

LANDFORMS:

WETLAND DENSITY: 0-10%

Outwash Plain

OPEN WATER DENSITY: 1-40%

FEATURES: Pond  
Stream <10' wide  
Swamp/Marsh

LOCATION:

DISTANCE: 69 mi Kalamazoo

APPROX. DRIVING TIME: 1 hr 13 min

BRANCH COUNTY

Wild Area 1 is located in the northeast corner of the county and is set in surroundings of rolling farmlands and forests. The vegetation is mature forest with undergrowth; however, some tracts within the area have been recently cut over. The site is entirely privately owned.

Wild Area 4 which is also privately owned, lies in the northwest part of the county on the St. Joseph River. Although the vegetation is a dense mixture of deciduous species, there are openings. The eastern boundary includes a dam; the remaining peripheral land use is dominantly farmland, forest, brush and open areas.

Wild Area 6 is east of Dragon Lake in the southcentral part of Branch County. The nearly flat terrain supports primarily deciduous forest with undergrowth. The land is farmed to the north and east, but residential uses lie to the south. A campground west of Dragon Lake is privately owned as is the Wild Area itself. Since it allowed for better distribution of Wild Areas in the county, this site was field-checked instead of Wild Areas 2 or 3, which also had point totals of 95.

Table A4.--Physical Characteristics of Wild Areas--Ionia County.

|                               |                               |
|-------------------------------|-------------------------------|
| WILD AREA: 1                  | COUNTY: Ionia                 |
| AREA: 250 acres               | VEGETATION COMPOSITION:       |
| LOCAL RELIEF: 20 feet         | BROADLEAVED: 84%              |
| SLOPE: 0-6%                   | CONIFEROUS: 1%                |
| SOIL DRAINAGE: Poorly Drained | RANGELAND: 15%                |
| SOIL TEXTURE: Organic         | HYDROGRAPHY:                  |
| LANDFORMS:                    | WETLAND DENSITY: 0-10%        |
| Outwash Plain                 | OPEN WATER DENSITY: 1-40%     |
| Floodplain                    | FEATURES: Stream 10'-50' wide |

LOCATION:

DISTANCE TO: 39 mi Lansing

APPROX. DRIVING TIME: 42 minutes

|                                           |                            |
|-------------------------------------------|----------------------------|
| WILD AREA: 2                              | COUNTY: Ionia              |
| AREA: 1800 acres                          | VEGETATION COMPOSITION:    |
| LOCAL RELIEF: 110 feet                    | BROADLEAVED: 85%           |
| SLOPE: 18+%                               | CONIFEROUS: 0%             |
| SOIL DRAINAGE: Somewhat Poorly<br>Drained | RANGELAND: 15%             |
| SOIL TEXTURE: Loam                        | HYDROGRAPHY:               |
| LANDFORMS:                                | WETLAND DENSITY: 0-10%     |
| Outwash Plain (Spillway)                  | OPEN WATER DENSITY: 1-40%  |
| Stream Cut Valley                         | FEATURES: Stream >50' wide |

LOCATION:

DISTANCE: 36 mi Lansing

APPROX. DRIVING TIME: 38 minutes

WILD AREA: 3

COUNTY: Ionia

AREA: 300 acres

VEGETATION COMPOSITION:

LOCAL RELIEF: 100 feet

BROADLEAVED: 70%

SLOPE: 18+%

CONIFEROUS: 0%

SOIL DRAINAGE: Well Drained

RANGELAND: 30%

SOIL TEXTURE: Loam

HYDROGRAPHY:

LANDFORMS:

WETLAND DENSITY: 0-10%

Outwash Plain (Spillway)  
Stream Cut Valley

OPEN WATER DENSITY: 1-40%

FEATURES: Stream >50' wide

LOCATION:

DISTANCE TO: 23 mi Lansing

APPROX. DRIVING TIME: 26 minutes

WILD AREA: 4

COUNTY: Ionia

AREA: 310 acres

VEGETATION COMPOSITION:

LOCAL RELIEF: 80 feet

BROADLEAVED: 90%

SLOPE: 18+%

CONIFEROUS: 5%

SOIL DRAINAGE: Well Drained

RANGELAND: 5%

SOIL TEXTURE: Sand

HYDROGRAPHY:

LANDFORMS:

WETLAND DENSITY: 0-10%

Outwash Plain  
Floodplain

OPEN WATER DENSITY: 1-40%

FEATURES: Stream >50' wide

LOCATION:

DISTANCE: 31 mi Grand Rapids

APPROX. DRIVING TIME: 34 minutes

WILD AREA: 5

COUNTY: Ionia

AREA: 300 acres

VEGETATION COMPOSITION:

LOCAL RELIEF: 150 feet

BROADLEAVED: 92%

SLOPE: 18+%

CONIFEROUS: 1%

SOIL DRAINAGE: Well Drained

RANGELAND: 7%

SOIL TEXTURE: Sand

HYDROGRAPHY:

LANDFORMS:

WETLAND DENSITY: 0-10%

Outwash Plain  
Floodplain

OPEN WATER DENSITY: 1-40%

FEATURES: Stream >50' wide

LOCATION:

DISTANCE TO: 32 mi Grand Rapids

APPROX. DRIVING TIME: 36 minutes

IONIA COUNTY

Three potential sites were selected for field checks in Ionia County. Each is largely covered with mature deciduous trees, and is traversed by a major Michigan river, adding to the wilderness-like aspect of these potential Wild Areas. Much of the land involved is state owned, either maintained as a Game Area, or under the auspices of the DNR.

Wild Area 2 in eastern Ionia County, is a remote site cut by the Maple River and fringed by farmland and brush. To the southwest is a sportmen's club. The small parcel which is not privately owned is managed by the DNR.

Situated along the Grand River in Ionia County, Wild Area 3 is located almost entirely within the Portland State Game Area. After field checking, a 40-acre section of rangeland and coniferous and deciduous trees which had appeared undesirable on the imagery, was added to the Wild Area. The adjacent areas here combine farmland, forest, brush and open lands.

Wild Area 5 at the western edge of the county, sits in a meander of the Flat River, abutting it on the north and south. Along the northern stretch of the river, a covered bridge has been dedicated as a Michigan Historical Site and a picnic area has been developed. The State manages only a quarter of the area, and it is accessible only from the east. Land cover nearby is limited to farm and forestland.

Table A5.--Physical Characteristics of Wild Areas--Livingston County.

|                                  |                                           |
|----------------------------------|-------------------------------------------|
| WILD AREA: 1                     | COUNTY: Livingston                        |
| AREA: 400 acres                  | VEGETATION COMPOSITION:                   |
| LOCAL RELIEF: 170 feet           | BROADLEAVED: 70%                          |
| SLOPE: 18+%                      | CONIFEROUS: 15%                           |
| SOIL DRAINAGE: Well Drained      | RANGELAND: 15%                            |
| SOIL TEXTURE: Sand               | HYDROGRAPHY:                              |
| LANDFORMS:                       | WETLAND DENSITY: 0-10%                    |
| End Moraine                      | OPEN WATER DENSITY: 1-40%                 |
|                                  | FEATURES: Stream <10' wide<br>Swamp/Marsh |
| LOCATION:                        |                                           |
| DISTANCE TO: 20 mi Flint         |                                           |
| APPROX. DRIVING TIME: 21 minutes |                                           |

|                                  |                                                      |
|----------------------------------|------------------------------------------------------|
| WILD AREA: 2                     | COUNTY: Livingston                                   |
| AREA: 960 acres                  | VEGETATION COMPOSITION:                              |
| LOCAL RELIEF: 160 feet           | BROADLEAVED: 65%                                     |
| SLOPE: 18+%                      | CONIFEROUS: 0%                                       |
| SOIL DRAINAGE: Poorly Drained    | RANGELAND: 35%                                       |
| SOIL TEXTURE: Organic            | HYDROGRAPHY:                                         |
| LANDFORMS:                       | WETLAND DENSITY: 0-10%                               |
| End Moraine                      | OPEN WATER DENSITY: 1-40%                            |
| Outwash Plain                    | FEATURES: Pond<br>Stream 10'-50' wide<br>Swamp/Marsh |
| LOCATION:                        |                                                      |
| DISTANCE: 17 mi Ann Arbor        |                                                      |
| APPROX. DRIVING TIME: 19 minutes |                                                      |

WILD AREA: 3

COUNTY: Livingston

AREA: 800 acres

VEGETATION COMPOSITION:

LOCAL RELIEF: 70 feet

BROADLEAVED: 83%

SLOPE: 18+%

CONIFEROUS: 2%

SOIL DRAINAGE: Poorly Drained

RANGELAND: 15%

SOIL TEXTURE: Loam

HYDROGRAPHY:

LANDFORMS:

WETLAND DENSITY: 0-10%

Outwash Plain  
End Moraine

OPEN WATER DENSITY: <1%

FEATURES: Swamp/Marsh

LOCATION:

DISTANCE TO: 26 mi Pontiac

APPROX. DRIVING TIME: 31 minutes

WILD AREA: 4

COUNTY: Livingston

AREA: 350 acres

VEGETATION COMPOSITION:

LOCAL RELIEF: 80 feet

BROADLEAVED: 60%

SLOPE: 18+%

CONIFEROUS: 0%

SOIL DRAINAGE: Well Drained

RANGELAND: 40%

SOIL TEXTURE: Loam

HYDROGRAPHY:

LANDFORMS:

WETLAND DENSITY: 11-30%

End Moraine  
Outwash Plain

OPEN WATER DENSITY: <1%

FEATURES: Swamp/Marsh

LOCATION:

DISTANCE: 22 mi Ann Arbor

APPROX. DRIVING TIME: 23 minutes



WILD AREA: 5

COUNTY: Livingston

AREA: 600 acres

VEGETATION COMPOSITION:

LOCAL RELIEF: 80 feet

BROADLEAVED: 55%

SLOPE: 18+%

CONIFEROUS: 0%

SOIL DRAINAGE: Well Drained

RANGELAND: 45%

SOIL TEXTURE: Sand

HYDROGRAPHY:

LANDFORMS:

WETLAND DENSITY: 11-30%

End Moraine  
Outwash Plain

OPEN WATER DENSITY: <1%

FEATURES: Stream <10' wide

LOCATION:

DISTANCE TO: 25 mi Ann Arbor

APPROX. DRIVING TIME: 28 minutes

WILD AREA: 6

COUNTY: Livingston

AREA: 1300 acres

VEGETATION COMPOSITION:

LOCAL RELIEF: 70 feet

BROADLEAVED: 54%

SLOPE: 18+%

CONIFEROUS: 1%

SOIL DRAINAGE: Poorly Drained

RANGELAND: 45%

SOIL TEXTURE: Organic

HYDROGRAPHY:

LANDFORMS:

WETLAND DENSITY: 0-10%

Outwash Plain  
Floodplain

OPEN WATER DENSITY: 1-40%

FEATURES: Pond  
Stream <10' wide  
Swamp/Marsh

LOCATION:

DISTANCE: 19 mi Ann Arbor

APPROX. DRIVING TIME: 20 minutes

WILD AREA: 7

COUNTY: Livingston

AREA: 720 acres

VEGETATION COMPOSITION:

LOCAL RELIEF: 140 feet

BROADLEAVED: 82%

SLOPE: 18+%

CONIFEROUS: 3%

SOIL DRAINAGE: Well Drained

RANGELAND: 15%

SOIL TEXTURE: Sand

HYDROGRAPHY:

LANDFORMS:

WETLAND DENSITY: 0-10%

End Moraine

OPEN WATER DENSITY: <1%

FEATURES: Swamp/Marsh

LOCATION:

DISTANCE TO: 21 mi Ann Arbor

APPROX. DRIVING TIME: 23 minutes

LIVINGSTON COUNTY

Since moraines associated with an interlobate area cross Livingston County, the topographic variation allows for stringent application of the criteria for Wild Area selection. Sites chosen in rugged terrain normally have vegetation and water bodies close to the statutory description: lakes abound, and diversity of ecological habitats encourages the development of different vegetative communities in close proximity to one another. Further facilitating the designation of Wild Areas in Livingston County is the extensive amount of publicly owned land.

Wild Area 1 encompasses a mixture of deciduous, coniferous and range-land vegetation in northeastern Livingston County. The land is privately owned, including an east-west strip which belongs to Detroit Edison. Close by, much of the land has been developed for residential use, though to the south are orchards and a ski club.

In southern Livingston County, the Huron River bisects Wild Area 2, most of which the Huron-Clinton Metropolitan Authority manages. Here, numerous deciduous species are intermixed with open areas, including some picnic sites. West of the Wild Area, the land is presently in low density residential use, however, it has been surveyed for residential lots. Elsewhere, peripheral land use mixes agriculture, forest and open areas.

Since Wild Area 6 is located in the Island Lake Recreation Area, the land is managed by the DNR. Rangeland and deciduous forests comprise the local vegetation. Surrounding land use includes single family residences, open areas, a state park and an extractive operation.

Some of Wild Area 7 which is also in the south, lies in the Brighton Recreation Area. The DNR manages all but one-quarter of the site, which is privately owned. Deciduous trees dominate the land cover with some open areas. Only away from the site does one see open water in a nearby state park. In addition, wooded, brushy and open lands and single family residences surround the Wild Area.

Table A6:--Physical Characteristics of Wild Areas--St. Clair County.

|                               |                               |
|-------------------------------|-------------------------------|
| WILD AREA: 1                  | COUNTY: St. Clair             |
| AREA: 175 acres               | VEGETATION COMPOSITION:       |
| LOCAL RELIEF: 55 feet         | BROADLEAVED: 85%              |
| SLOPE: 0-6%                   | CONIFEROUS: 0%                |
| SOIL DRAINAGE: Poorly Drained | RANGELAND: 15%                |
| SOIL TEXTURE: Loam            | HYDROGRAPHY:                  |
| LANDFORMS:                    | WETLAND DENSITY: 0-10%        |
| Lacustrine Plain              | OPEN WATER DENSITY: 1-40%     |
| Shallow Stream Valley         | FEATURES: Stream 10'-50' wide |

LOCATION:

DISTANCE TO: 55 mi Warren

APPROX. DRIVING TIME: 61 minutes

|                               |                         |
|-------------------------------|-------------------------|
| WILD AREA: 2                  | COUNTY: St. Clair       |
| AREA: 200 acres               | VEGETATION COMPOSITION: |
| LOCAL RELIEF: 20 feet         | BROADLEAVED: 95%        |
| SLOPE: 0-6%                   | CONIFEROUS: 0%          |
| SOIL DRAINAGE: Poorly Drained | RANGELAND: 5%           |
| SOIL TEXTURE: Loam            | HYDROGRAPHY:            |
| LANDFORMS:                    | WETLAND DENSITY: 0-10%  |
| Lacustrine Plain              | OPEN WATER DENSITY: <1% |
|                               | FEATURES: Swamp/Marsh   |

LOCATION:

DISTANCE: 56 mi Warren

APPROX. DRIVING TIME: 64 minutes

|                               |                               |
|-------------------------------|-------------------------------|
| WILD AREA: 3                  | COUNTY: St. Clair             |
| AREA: 175 acres               | VEGETATION COMPOSITION:       |
| LOCAL RELIEF: 15 feet         | BROADLEAVED: 90%              |
| SLOPE: 0-6%                   | CONIFEROUS: 0%                |
| SOIL DRAINAGE: Poorly Drained | RANGELAND: 10%                |
| SOIL TEXTURE: Loam            | HYDROGRAPHY:                  |
| LANDFORMS:                    | WETLAND DENSITY: 0-10%        |
| Lacustrine Plain              | OPEN WATER DENSITY: 1-40%     |
|                               | FEATURES: Stream 10'-50' wide |

LOCATION:

DISTANCE TO: 55 mi Warren  
APPROX. DRIVING TIME: 60 minutes

|                                           |                            |
|-------------------------------------------|----------------------------|
| WILD AREA: 4                              | COUNTY: St. Clair          |
| AREA: 350 acres                           | VEGETATION COMPOSITION:    |
| LOCAL RELIEF: 35 feet                     | BROADLEAVED: 95%           |
| SLOPE: 0-6%                               | CONIFEROUS: 0%             |
| SOIL DRAINAGE: Somewhat Poorly<br>Drained | RANGELAND: 5%              |
| SOIL TEXTURE; Loam                        | HYDROGRAPHY:               |
| LANDFORMS:                                | WETLAND DENSITY: 0-10%     |
| Lacustrine Plain                          | OPEN WATER DENSITY: <1%    |
| Shallow Stream Valley                     | FEATURES: Stream <10' wide |

LOCATION:

DISTANCE: 43 mi Warren  
APPROX. DRIVING TIME: 47 minutes

WILD AREA: 5  
AREA: 2650 acres  
LOCAL RELIEF: 150 feet  
SLOPE: 18+%  
SOIL DRAINAGE: Well Drained  
SOIL TEXTURE: Loam  
LANDFORMS:

Lacustrine Plain  
Stream Cut Valley  
Beach Ridges

LOCATION:

DISTANCE TO: 57 mi Warren  
APPROX. DRIVING TIME: 61 minutes

COUNTY: St. Clair  
VEGETATION COMPOSITION:  
BROADLEAVED: 88%  
CONIFEROUS: 2%  
RANGELAND: 10%  
HYDROGRAPHY:  
WETLAND DENSITY: 0-10%  
OPEN WATER DENSITY: 1-40%  
FEATURES: Pond  
Stream 10'-50' wide  
Swamp/Marsh

WILD AREA: 6  
AREA: 750 acres  
LOCAL RELIEF: 50 feet  
SLOPE: 0-6%  
SOIL DRAINAGE: Somewhat Poorly  
Drained  
SOIL TEXTURE: Sand  
LANDFORMS:

End Moraine  
Beach Ridge

LOCATION:

DISTANCE: 53 mi Warren  
APPROX. DRIVING TIME: 56 minutes

COUNTY: St. Clair  
VEGETATION COMPOSITION:  
BROADLEAVED: 95%  
CONIFEROUS: 0%  
RANGELAND: 5%  
HYDROGRAPHY:  
WETLAND DENSITY: 0-10%  
OPEN WATER DENSITY: <1%  
FEATURES: Stream <10' wide  
Swamp/Marsh

|                                           |                         |
|-------------------------------------------|-------------------------|
| WILD AREA: 7                              | COUNTY: St. Clair       |
| AREA: 960 acres                           | VEGETATION COMPOSITION: |
| LOCAL RELIEF: 40 feet                     | BROADLEAVED: 95%        |
| SLOPE: 0-6%                               | CONIFEROUS: 0%          |
| SOIL DRAINAGE: Somewhat Poorly<br>Drained | RANGELAND: 5%           |
| SOIL TEXTURE: Sand                        | HYDROGRAPHY:            |
| LANDFORMS:                                | WETLAND DENSITY: 0-10%  |
| Lacustrine Plain                          | OPEN WATER DENSITY: <1% |
|                                           | FEATURES: Swamp/Marsh   |

LOCATION:

DISTANCE TO: 51 mi Warren  
APPROX. DRIVING TIME: 55 minutes

|                                           |                         |
|-------------------------------------------|-------------------------|
| WILD AREA: 8                              | COUNTY: St. Clair       |
| AREA: 320 acres                           | VEGETATION COMPOSITION: |
| LOCAL RELIEF: 30 feet                     | BROADLEAVED: 93%        |
| SLOPE: 0-6%                               | CONIFEROUS: 0%          |
| SOIL DRAINAGE: Somewhat Poorly<br>Drained | RANGELAND: 7%           |
| SOIL TEXTURE: Sand                        | HYDROGRAPHY:            |
| LANDFORMS:                                | WETLAND DENSITY: 0-10%  |
| Lacustrine Plain<br>Floodplain            | OPEN WATER DENSITY: <1% |
|                                           | FEATURES:               |

LOCATION:

DISTANCE: 43 mi Warren  
APPROX. DRIVING TIME: 46 minutes



WILD AREA: 9

COUNTY: St. Clair

AREA: 520 acres

VEGETATION COMPOSITION:

LOCAL RELIEF: 30 feet

BROADLEAVED: 90%

SLOPE: 0-6%

CONIFEROUS: 0%

SOIL DRAINAGE: Somewhat Poorly  
Drained

RANGELAND: 10%

SOIL TEXTURE: Sand

HYDROGRAPHY:

LANDFORMS:

WETLAND DENSITY: 0-10%

Lacustrine Plain  
Shallow Stream Cut Valley

OPEN WATER DENSITY: 1-40%

FEATURES: Pond  
Stream 10'-50' wide

LOCATION:

DISTANCE TO: 46 mi Warren

APPROX. DRIVING TIME: 48 minutes

WILD AREA: 10

COUNTY: St. Clair

AREA: 420 acres

VEGETATION COMPOSITION:

LOCAL RELIEF: 10 feet

BROADLEAVED: 98%

SLOPE: 0-6%

CONIFEROUS: 0%

SOIL DRAINAGE: Somewhat Poorly  
Drained

RANGELAND: 2%

SOIL TEXTURE: Sand

HYDROGRAPHY:

LANDFORMS:

WETLAND DENSITY: 0-10%

Lacustrine Plain

OPEN WATER DENSITY: <1%

FEATURES: Swamp/Marsh

LOCATION:

DISTANCE: 35 mi Warren

APPROX. DRIVING TIME: 36 minutes

|                                           |                            |
|-------------------------------------------|----------------------------|
| WILD AREA: 11                             | COUNTY: St. Clair          |
| AREA: 480 acres                           | VEGETATION COMPOSITION:    |
| LOCAL RELIEF: 10 feet                     | BROADLEAVED: 97%           |
| SLOPE: 0-6%                               | CONIFEROUS: 0%             |
| SOIL DRAINAGE: Somewhat Poorly<br>Drained | RANGELAND: 3%              |
| SOIL TEXTURE: Sand                        | HYDROGRAPHY:               |
| LANDFORMS:                                | WETLAND DENSITY: 0-10%     |
| Lacustrine Plain                          | OPEN WATER DENSITY: <1%    |
|                                           | FEATURES: Stream <10' wide |

LOCATION:

DISTANCE TO: 37 mi Warren  
APPROX. DRIVING TIME: 41 minutes

|                                           |                         |
|-------------------------------------------|-------------------------|
| WILD AREA: 12                             | COUNTY: St. Clair       |
| AREA: 300 acres                           | VEGETATION COMPOSITION: |
| LOCAL RELIEF: 5 feet                      | BROADLEAVED: 93%        |
| SLOPE: 0-6%                               | CONIFEROUS: 0%          |
| SOIL DRAINAGE: Somewhat Poorly<br>Drained | RANGELAND: 7%           |
| SOIL TEXTURE: Loam                        | HYDROGRAPHY:            |
| LANDFORMS:                                | WETLAND DENSITY: 11-30% |
| Lacustrine Plain<br>Delta                 | OPEN WATER DENSITY: <1% |
|                                           | FEATURES: Swamp/Marsh   |

LOCATION:

DISTANCE: 40 mi Warren  
APPROX. DRIVING TIME: 44 minutes

ST. CLAIR COUNTY

With little exception, the six sites field checked in St. Clair County are flat tracts of privately owned land, and mature deciduous forests dominate their vegetative cover. Each Wild Area is set amidst a pastoral landscape of farmland, brush, forest and open areas.

Field checking was difficult at Wild Area 1 in northern St. Clair County, since it does not abut a road at any point. At Wild Area 4 in the central part of the county, however, access revealed that although a stream crossed it, the water looked stagnant. Peripheral land use here also includes single family homes.

The Black River runs the length of Wild Area 5 in the Port Huron State Game Area, though the river is dammed in its northern part. Diverse vegetation here is associated with the rugged topography. After field checking, a large wetland on M-136 was added due to its waterfowl population and aesthetic qualities. Some off-site development is evidenced by an animal kennel west of the site and low density residential to the east.

Both Wild Areas 6, in east central St. Clair County, and 9, in the center of the county, are characterized by low relief, uneven-aged deciduous forest and only small streams. A few scattered tracts in Wild Area 6 are state owned, but none of Wild Area 9 is. Here too some low density residential development is included in the Wild Areas' peripheral land use.

At Wild Area 11 in the southern part of the county near Algonac State Park, little development has occurred on the site despite abundant residential expansion nearby. There is also a sod farm to the north and a horse stable east of the site.

# LEGEND

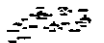
|                                                                                     |                     |
|-------------------------------------------------------------------------------------|---------------------|
|    | WILD AREA BOUNDARY  |
|    | SWAMP               |
|  | WATER BODIES        |
|  | TRAILS, DIRT ROADS  |
|  | INTERMITTENT STREAM |
|  | LIGHTHOUSE          |
|  | DAM                 |

Figure A1.

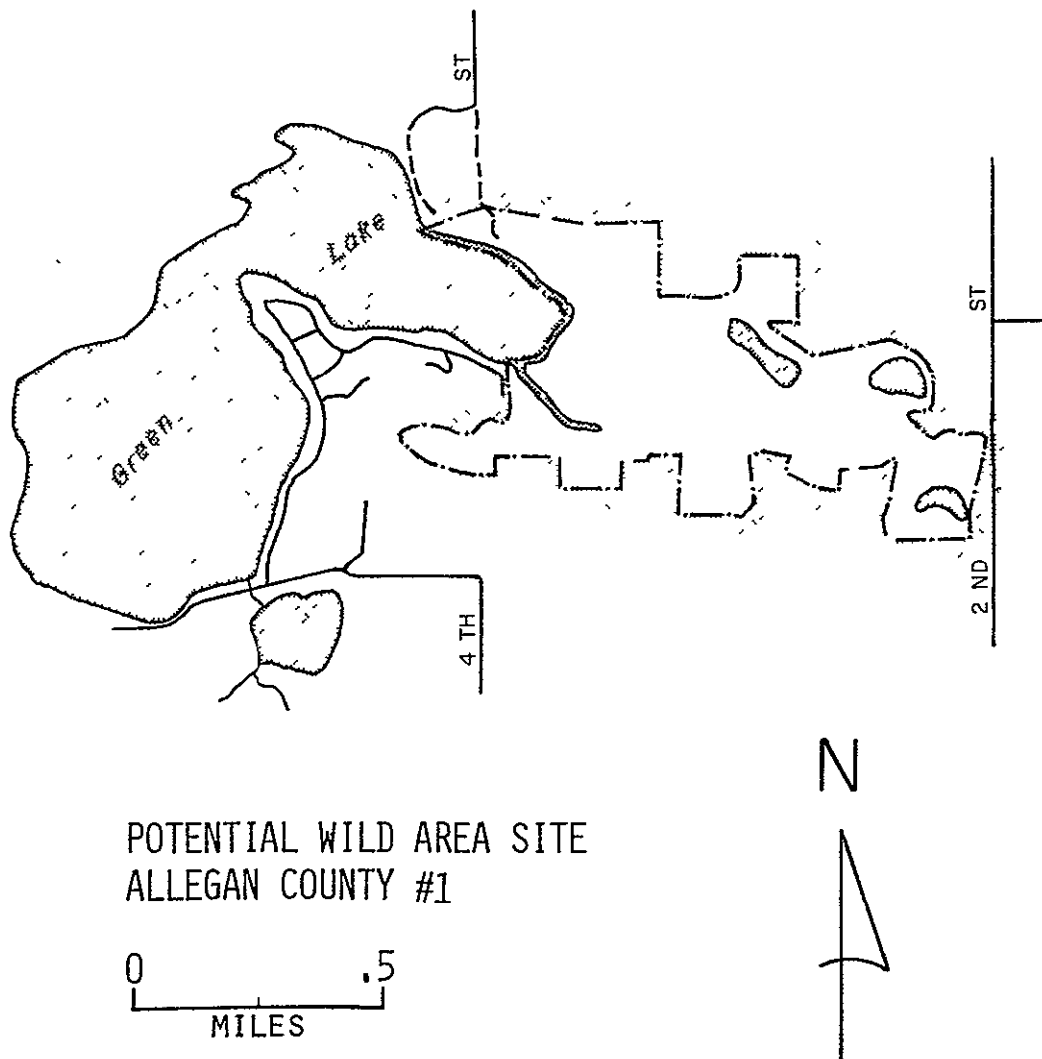
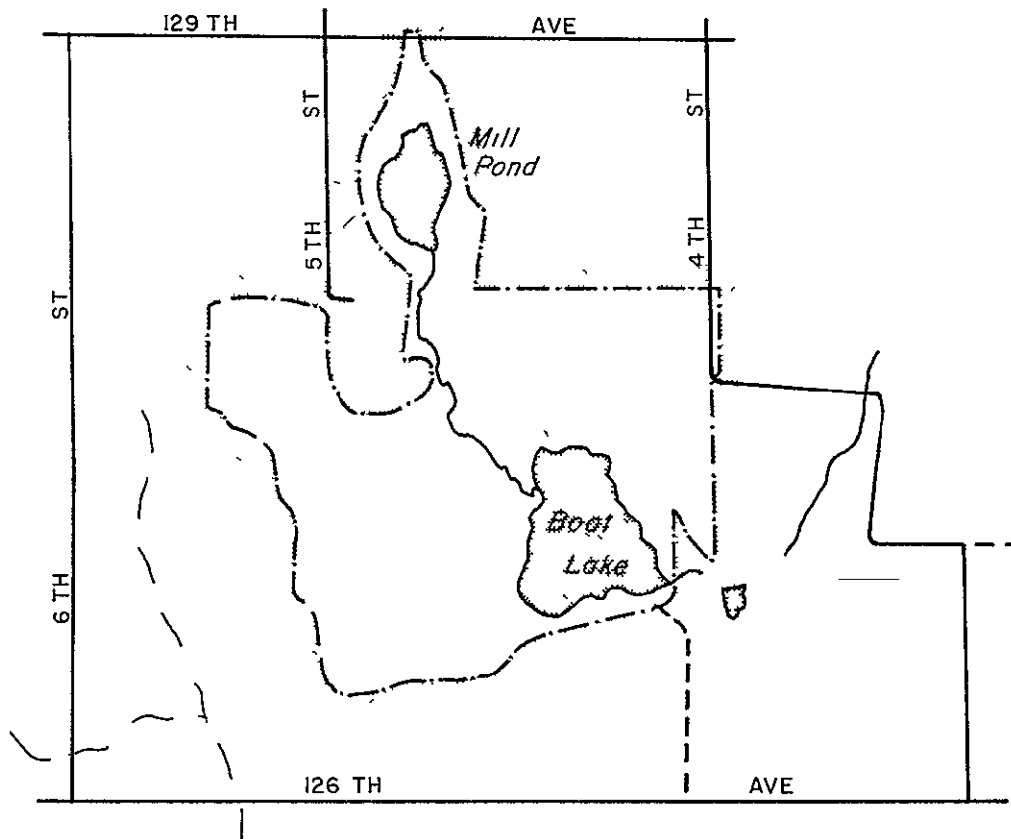


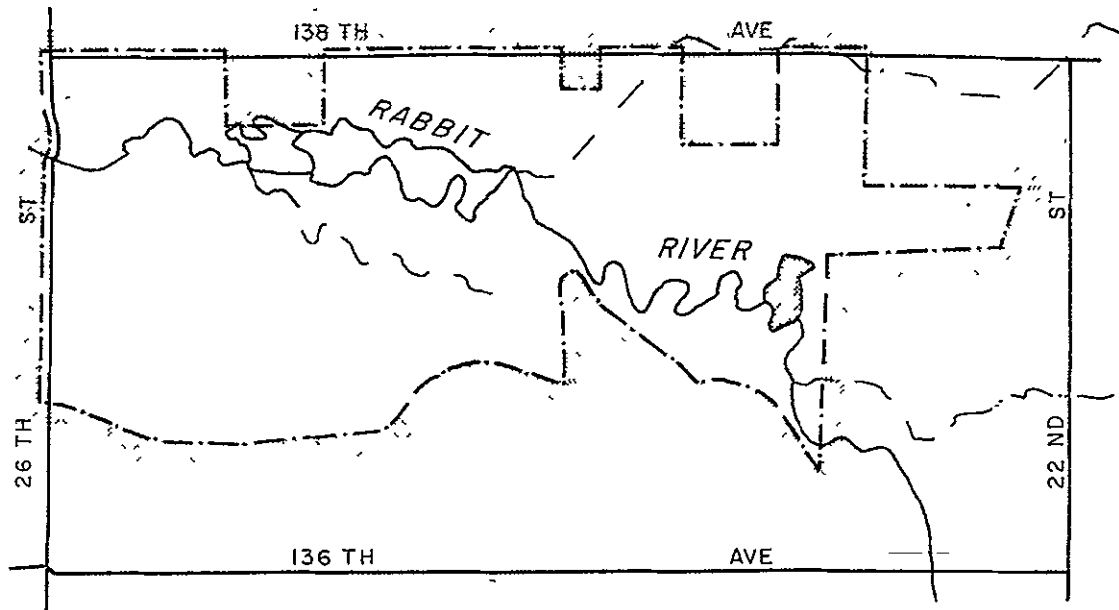
Figure A2.



POTENTIAL WILD AREA SITE  
ALLEGAN COUNTY #3

0 .5  
MILES

Figure A3.



POTENTIAL WILD AREA SITE  
ALLEGAN COUNTY #7

0 .5  
MILES

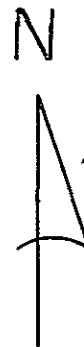


Figure A4.

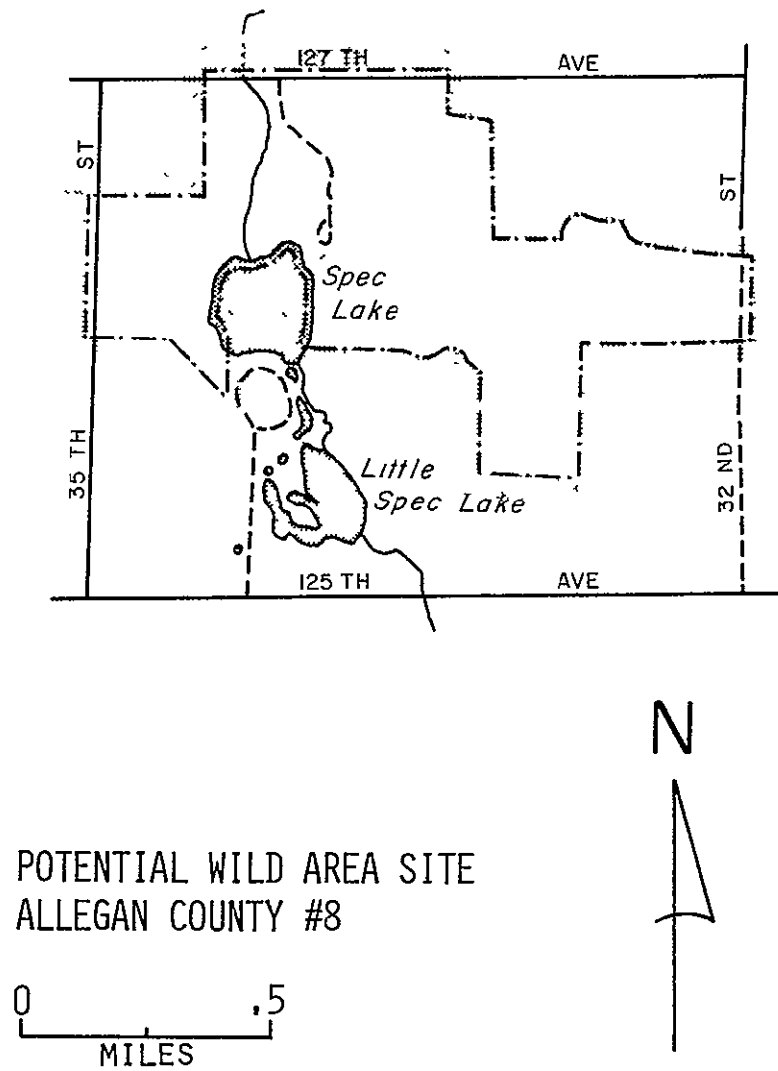
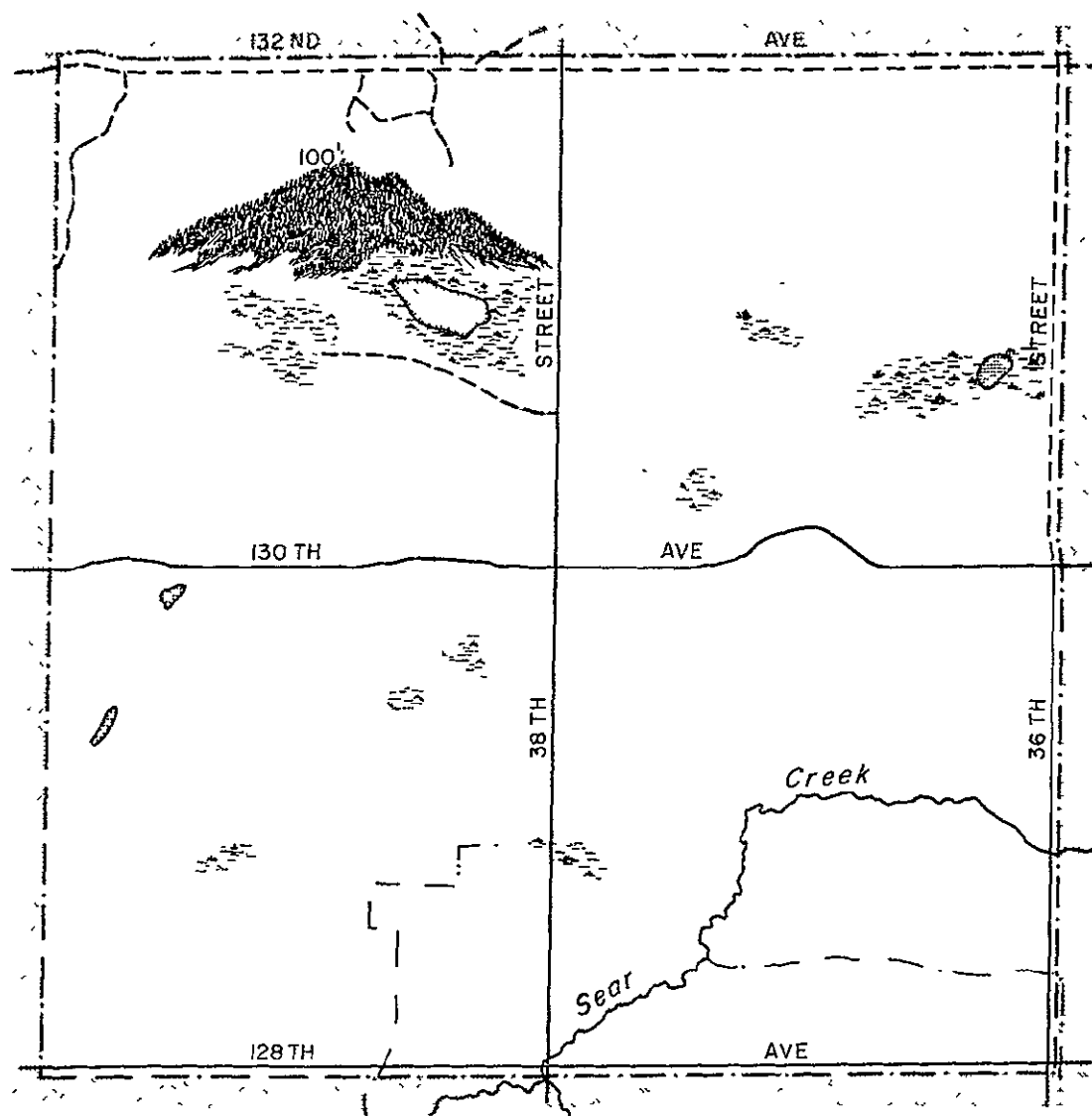


Figure A5.





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POTENTIAL WILD AREA SITE  
ALLEGAN COUNTY #9



Figure A6.

LAKE MICHIGAN

Kelly Lake

POTENTIAL WILD AREA SITE  
ALLEGAN COUNTY #13



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Gilligan Lake

ST

144 TH

ST

142 ND

ST

66 TH

ST

65 TH

140 TH

ST

64 TH

138 TH

ST

Figure A7.

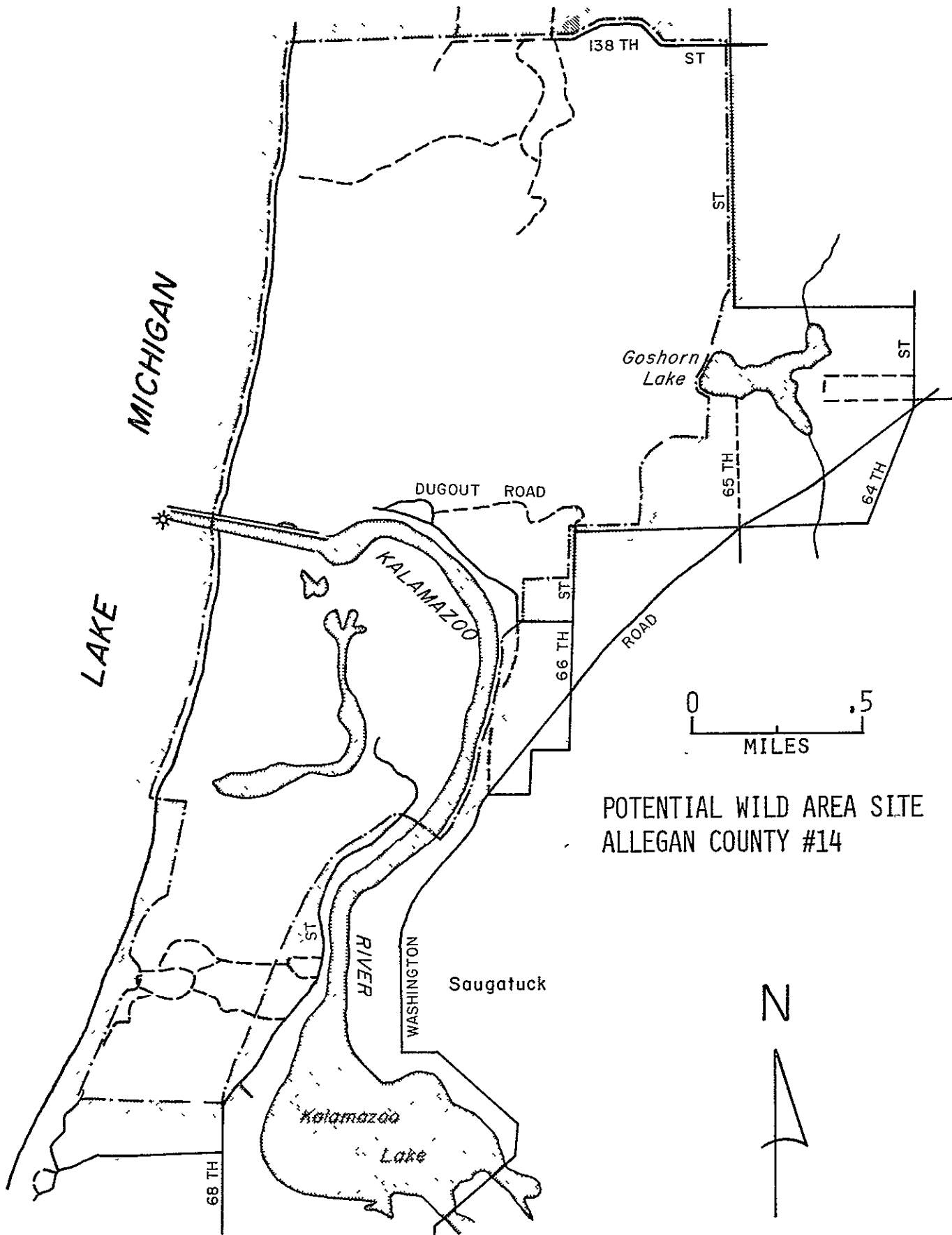


Figure A8.

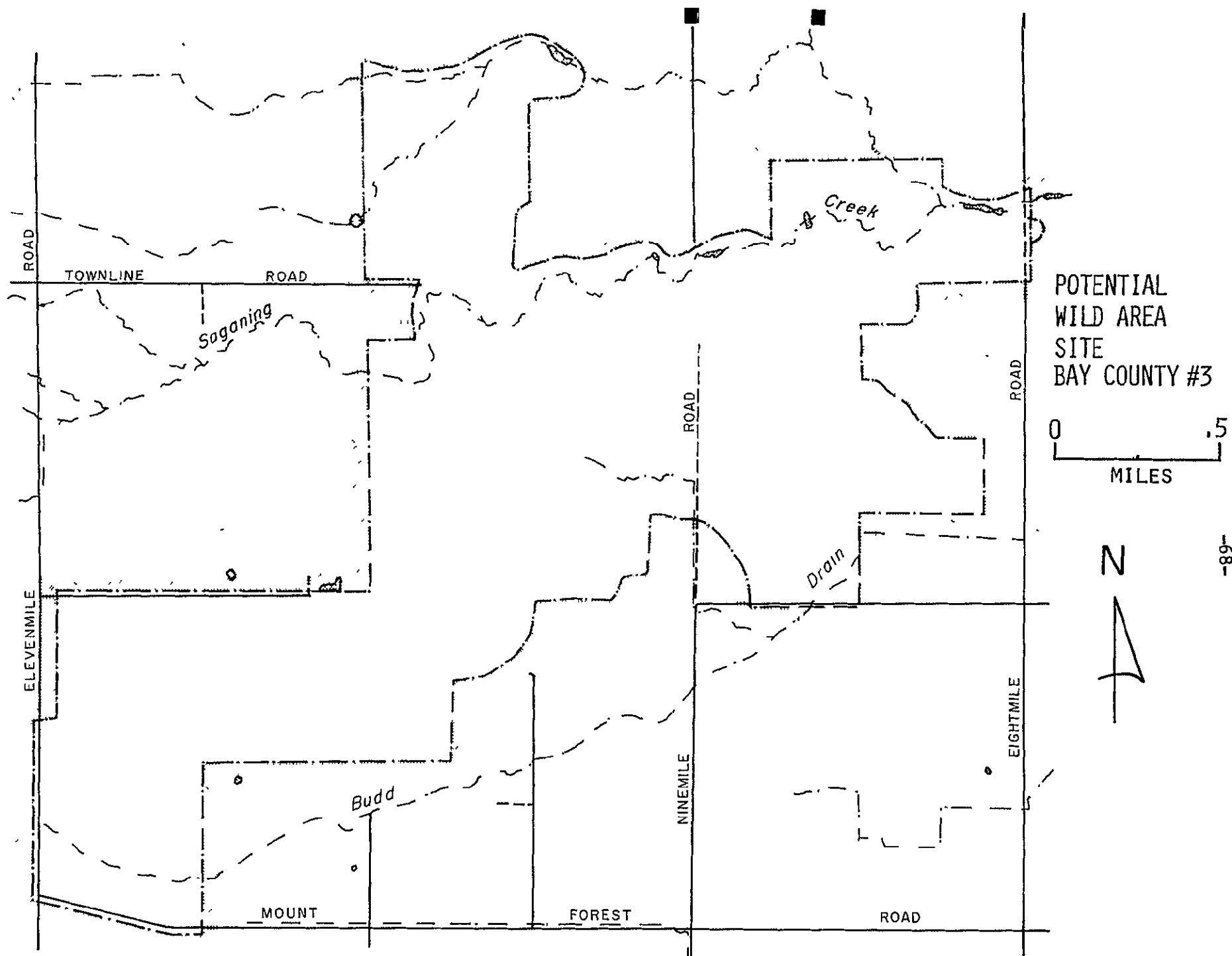
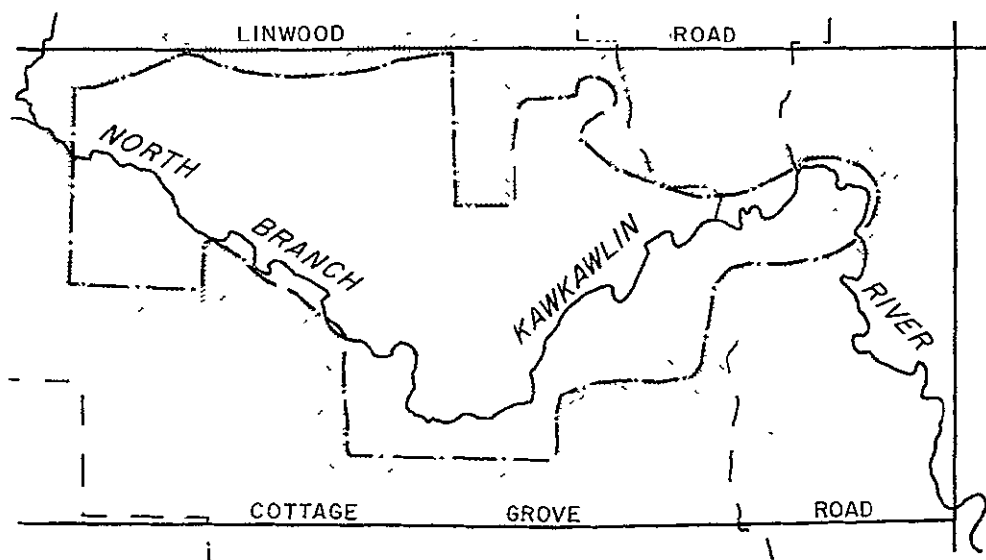


Figure A9.



POTENTIAL WILD AREA SITE  
BAY COUNTY #5

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Figure A10.

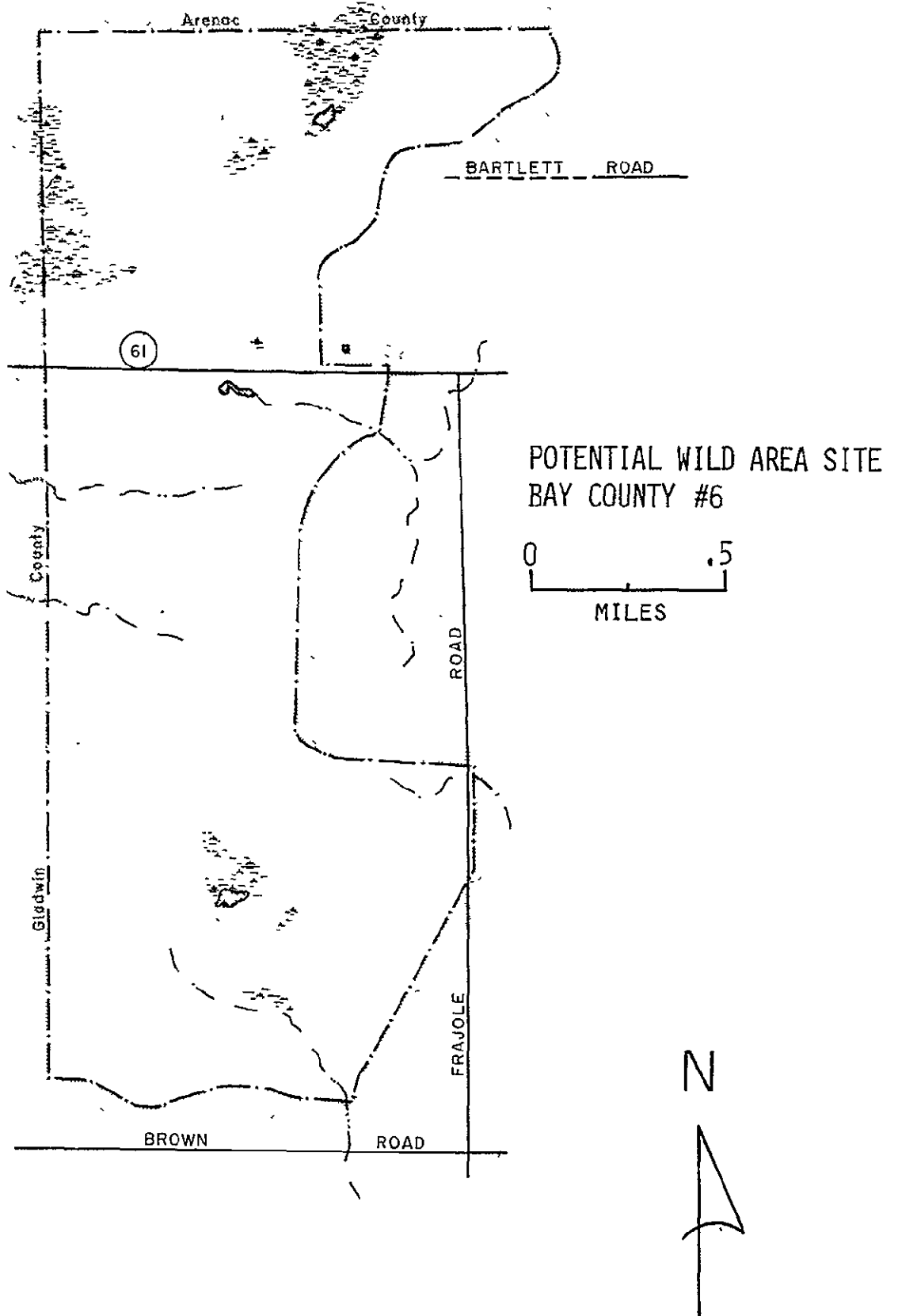


Figure All.

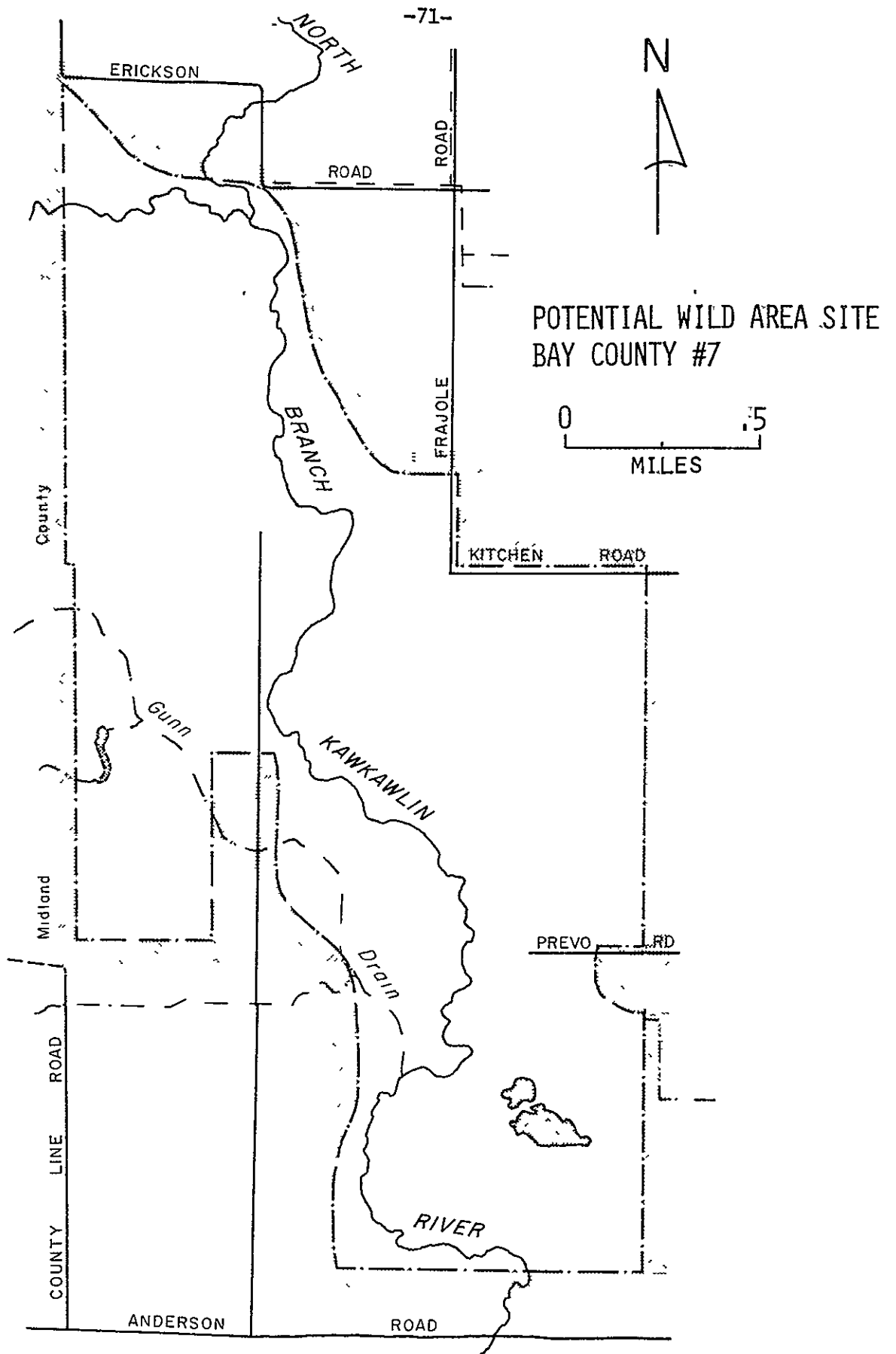
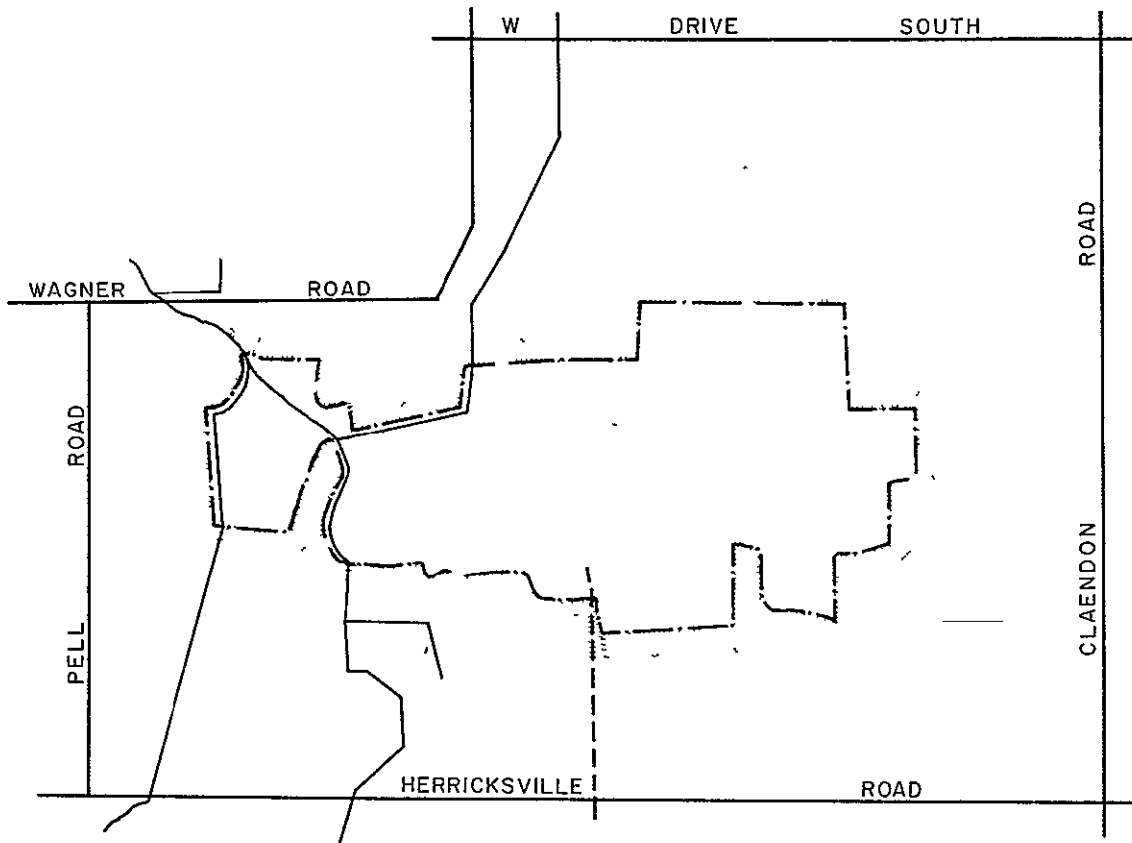


Figure A12.



POTENTIAL WILD AREA SITE  
BRANCH COUNTY #1

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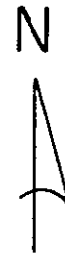


Figure A13.



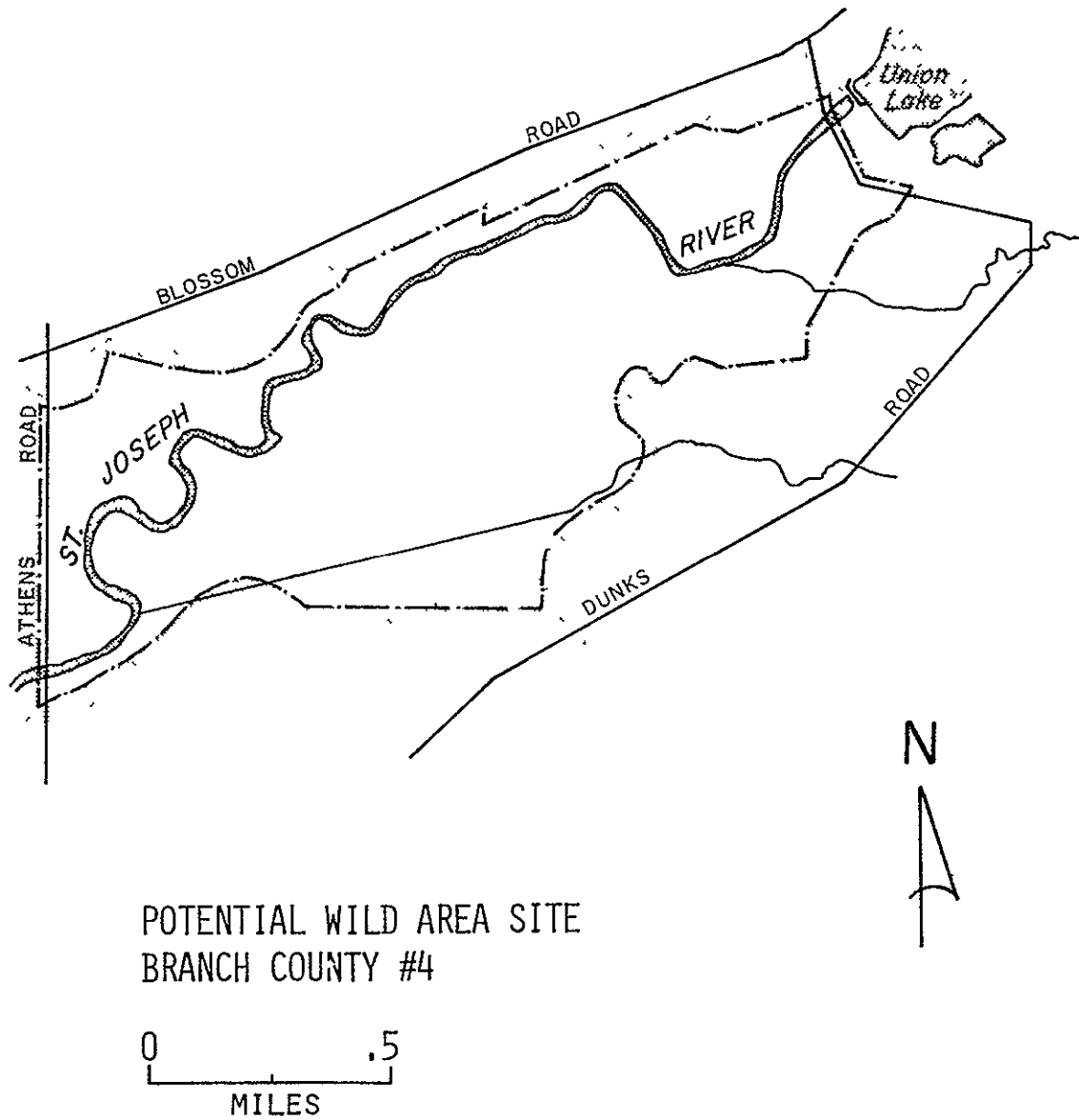


Figure A14.

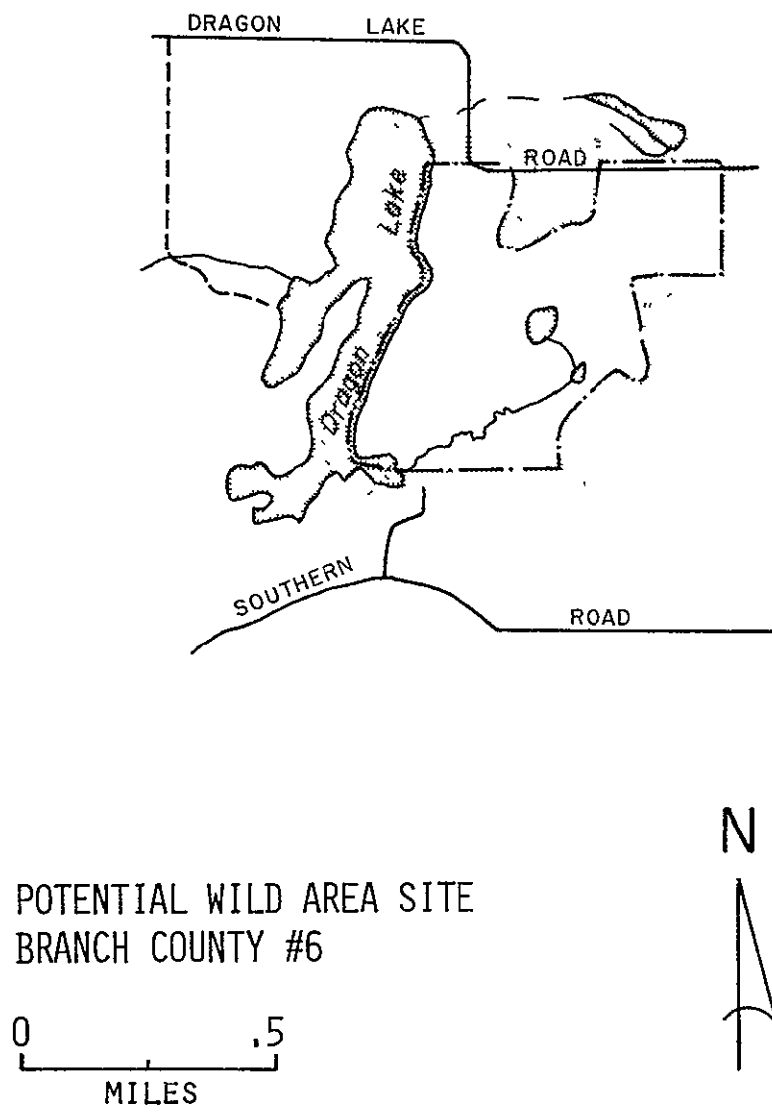
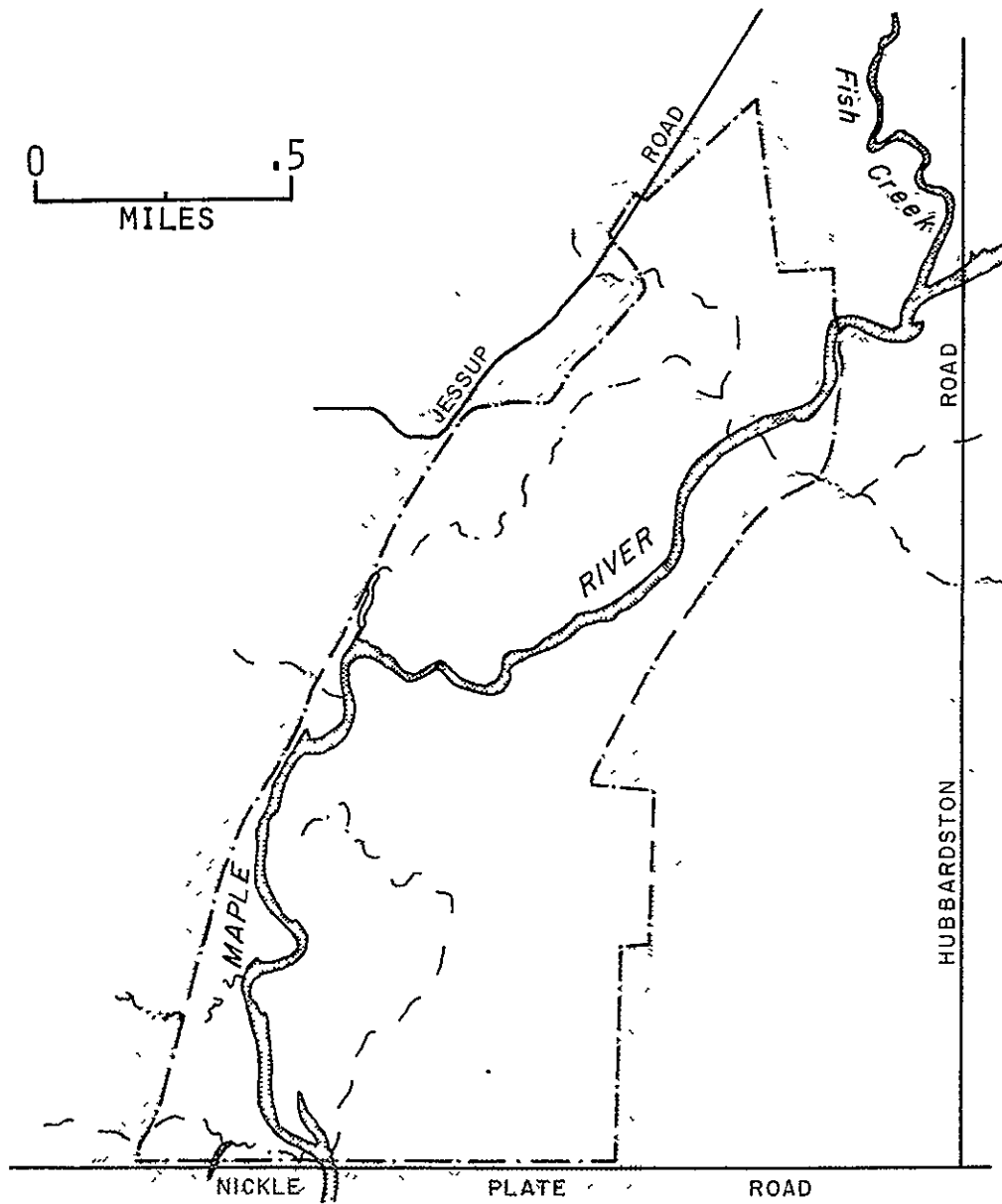


Figure A15.



POTENTIAL WILD AREA SITE  
NORTHERN SECTION  
IONIA COUNTY #2

Figure A16.

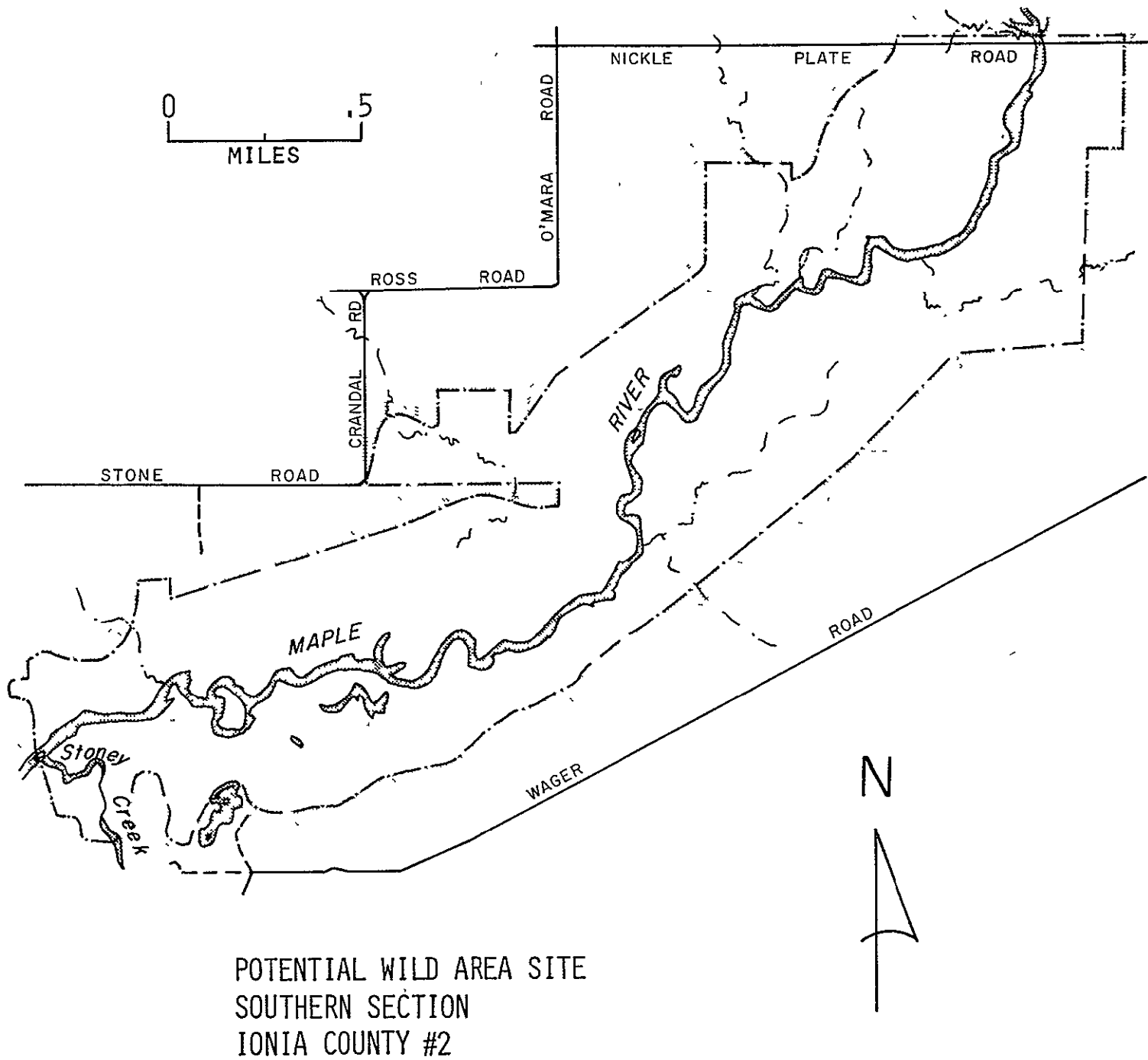
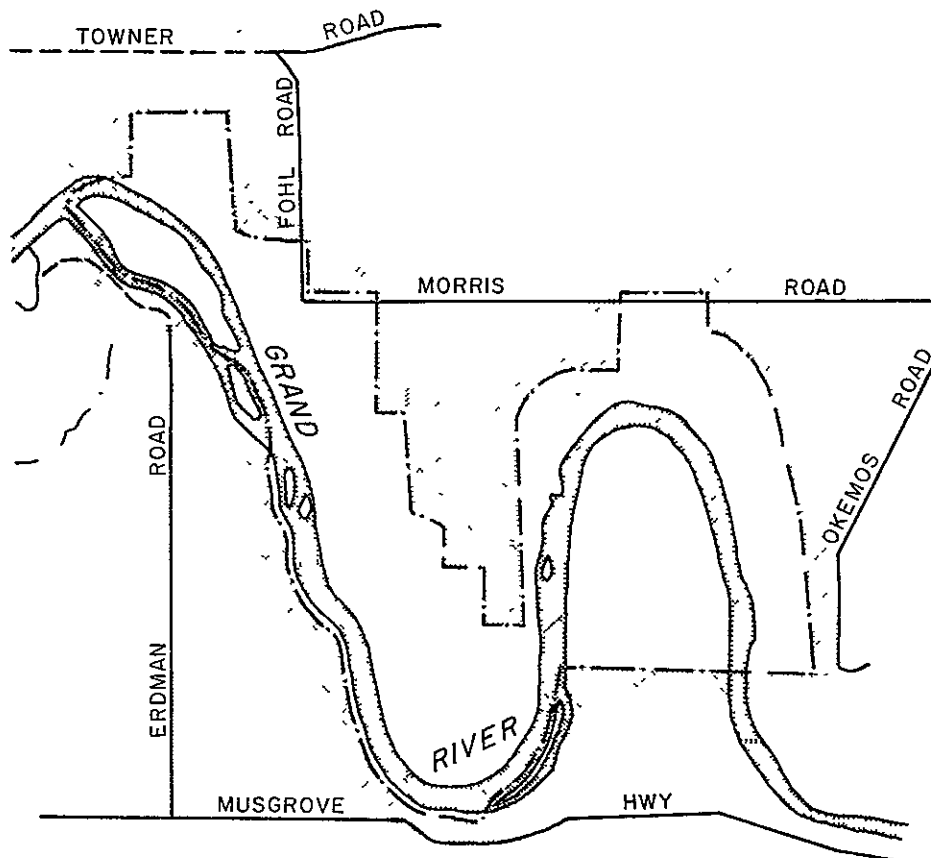


Figure A17.



POTENTIAL WILD AREA SITE  
IONIA COUNTY #3

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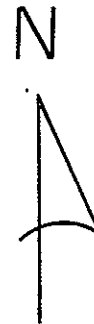


Figure A18.

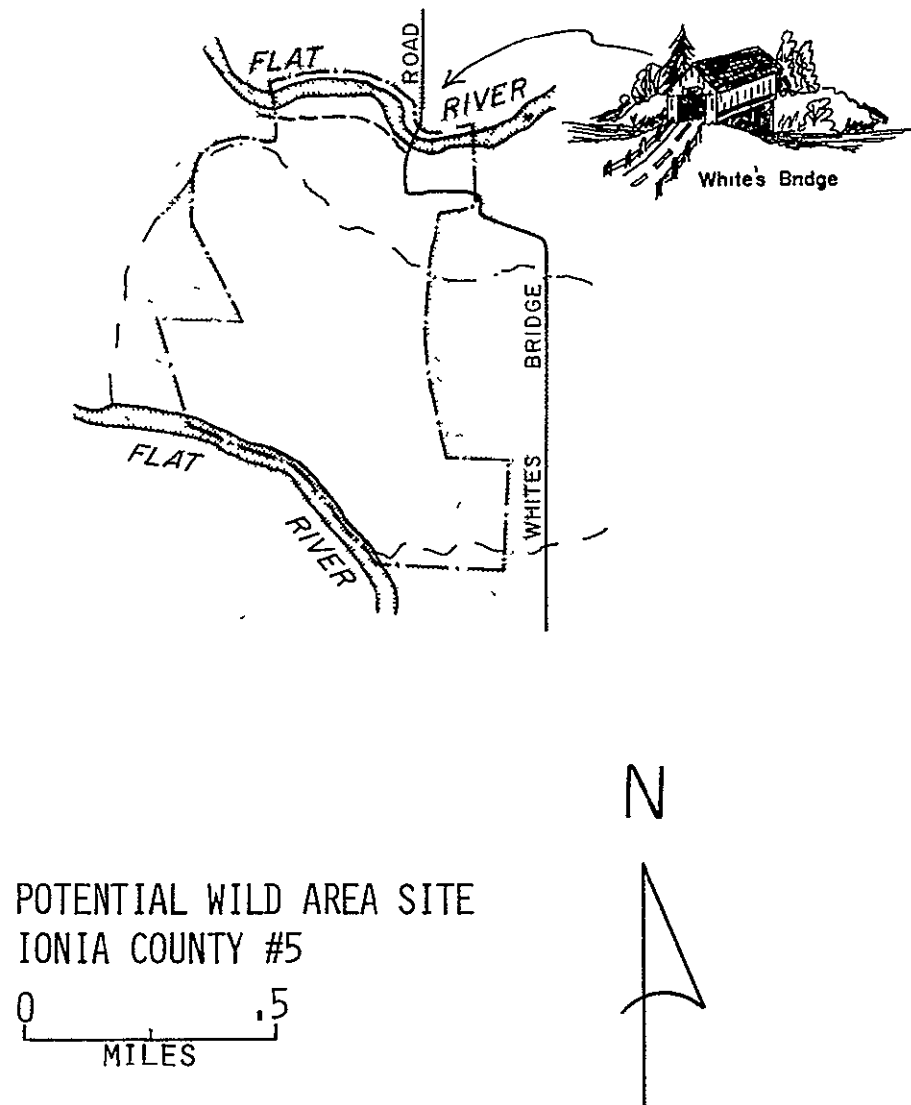
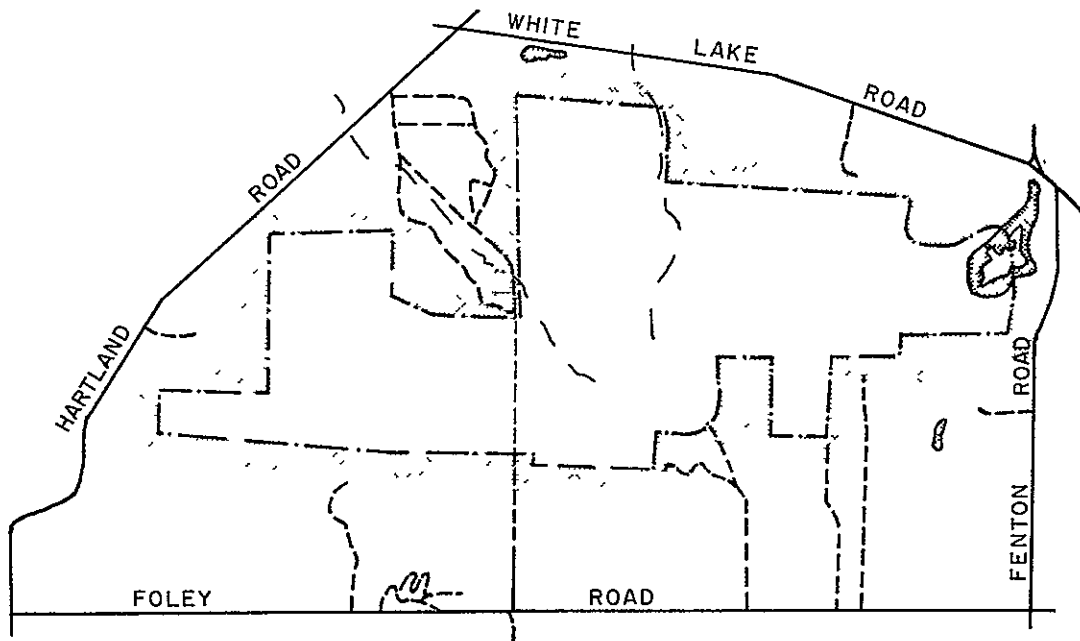


Figure A19.

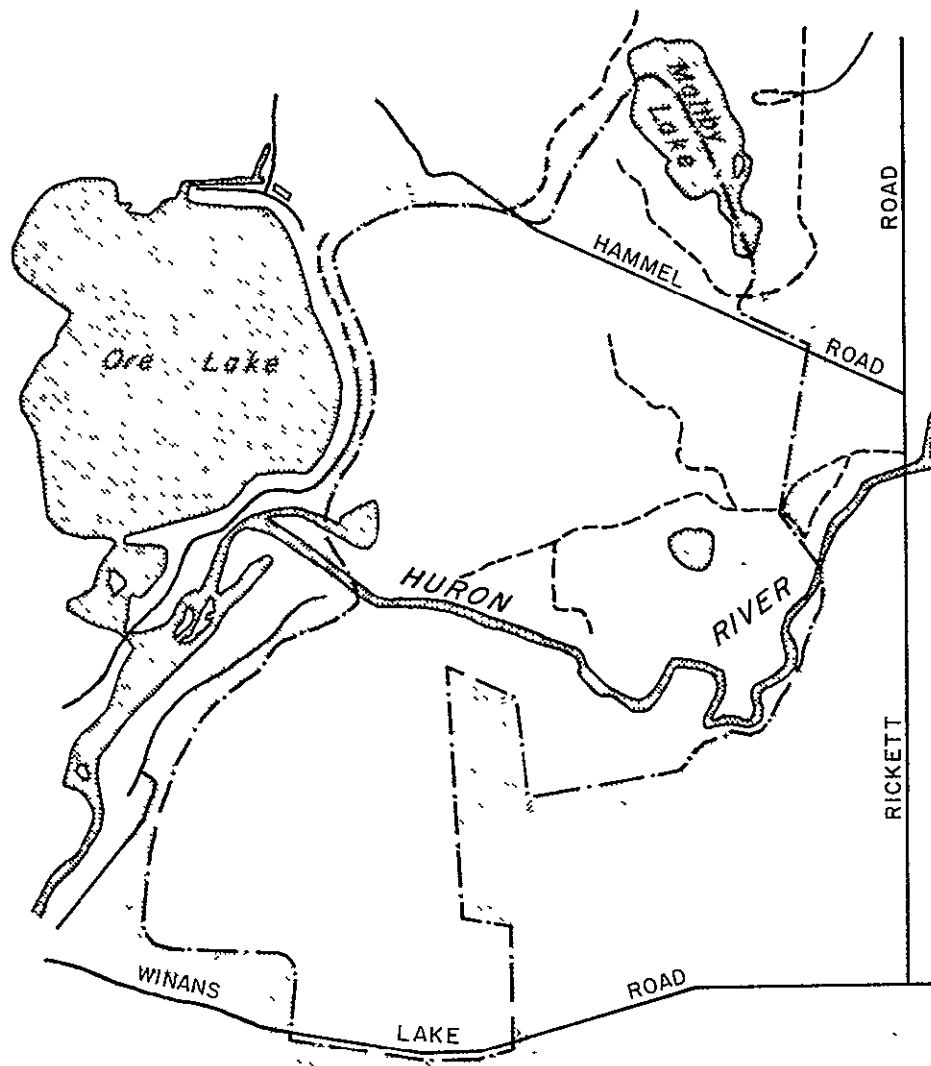


POTENTIAL WILD AREA SITE  
LIVINGSTON COUNTY #1

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MILES



Figure A20.



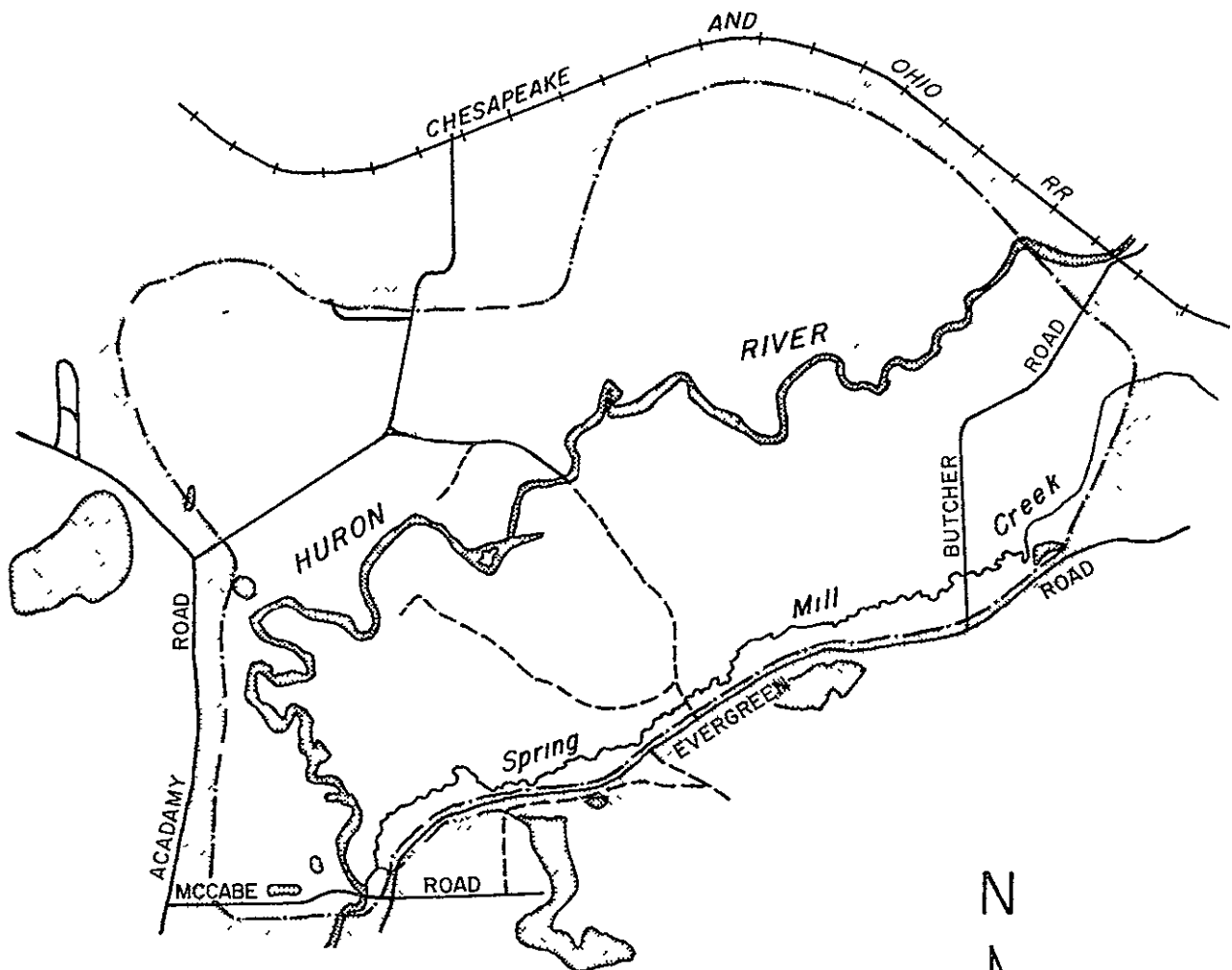
POTENTIAL WILD AREA SITE  
LIVINGSTON COUNTY #2

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Figure A21.

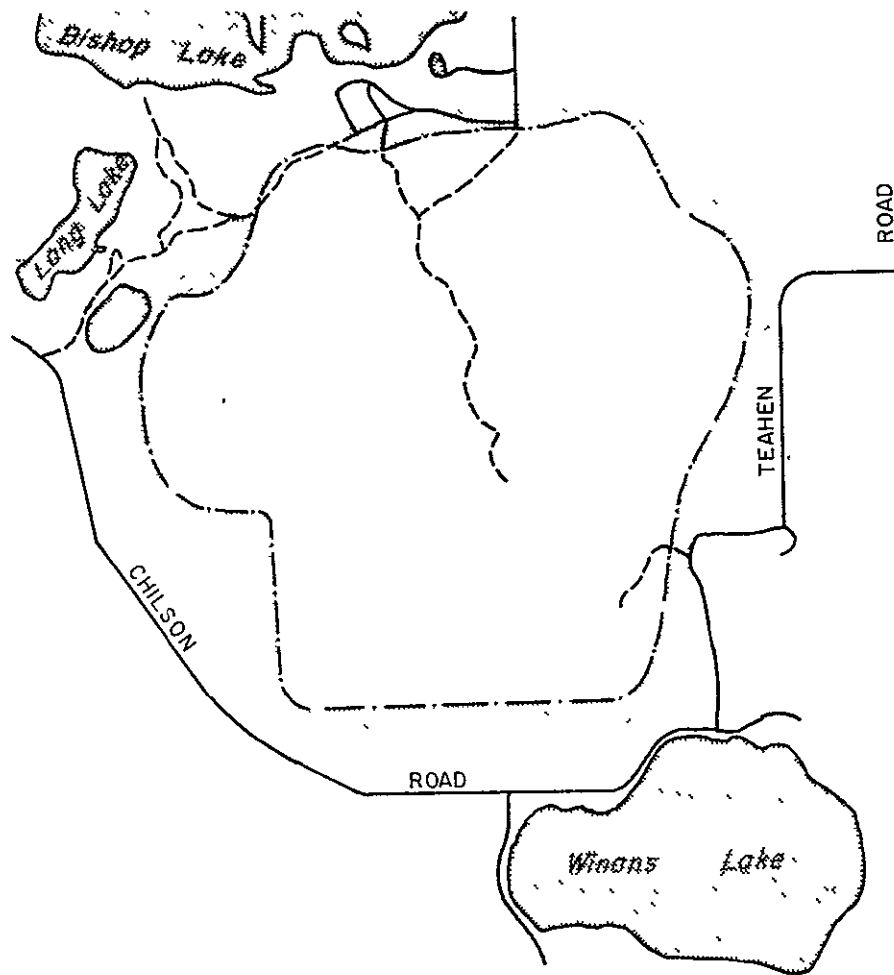




POTENTIAL WILD AREA SITE  
LIVINGSTON COUNTY #6

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Figure A22.

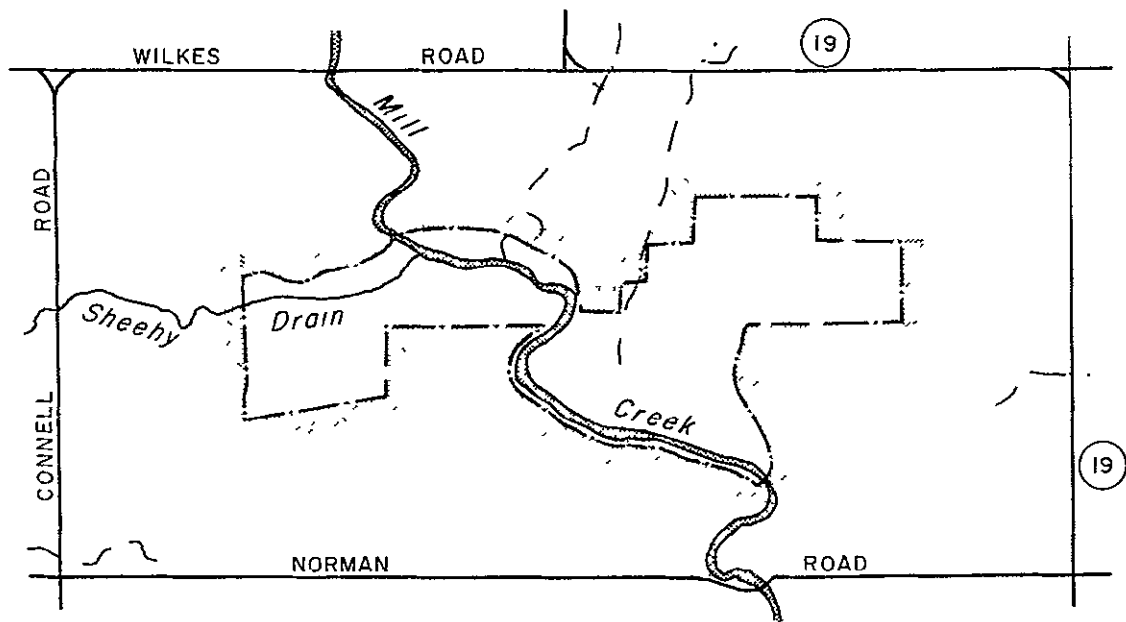


POTENTIAL WILD AREA SITE  
LIVINGSTON COUNTY #7

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Figure A23.

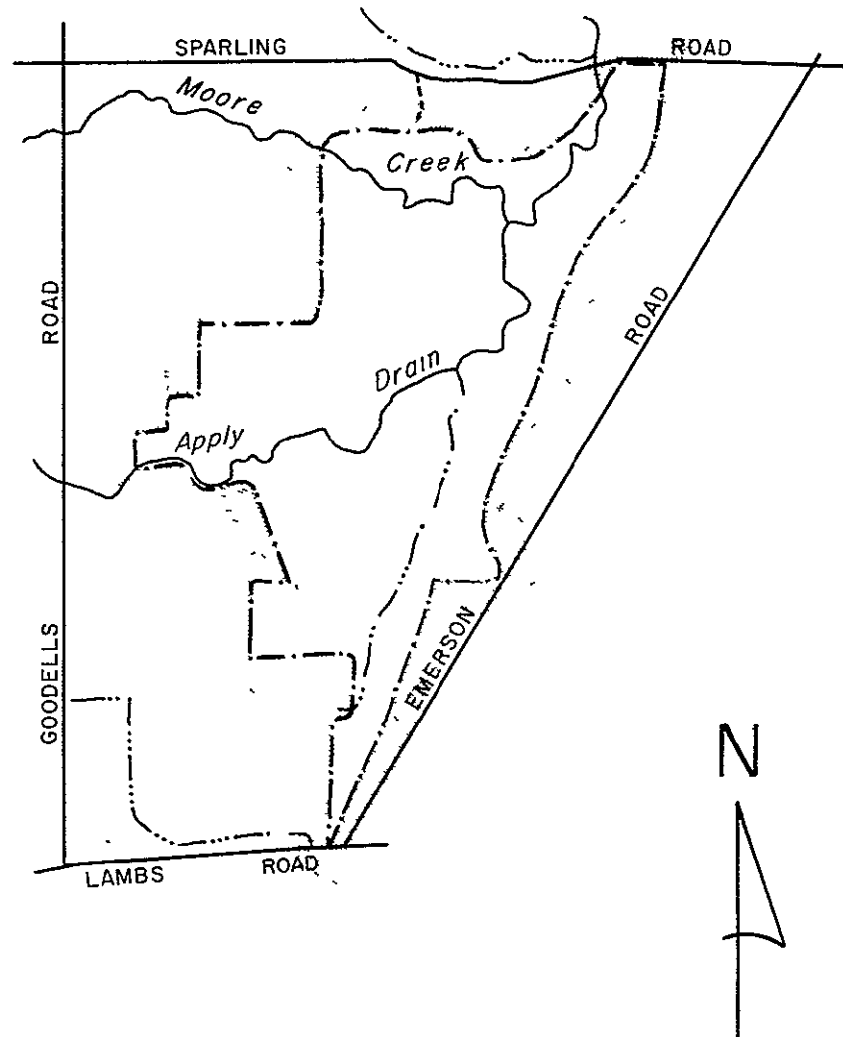


POTENTIAL WILD AREA SITE  
ST. CLAIR COUNTY #1

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MILES



Figure A24.



POTENTIAL WILD AREA SITE  
ST. CLAIR COUNTY #4

0 .5  
MILES

Figure A25.

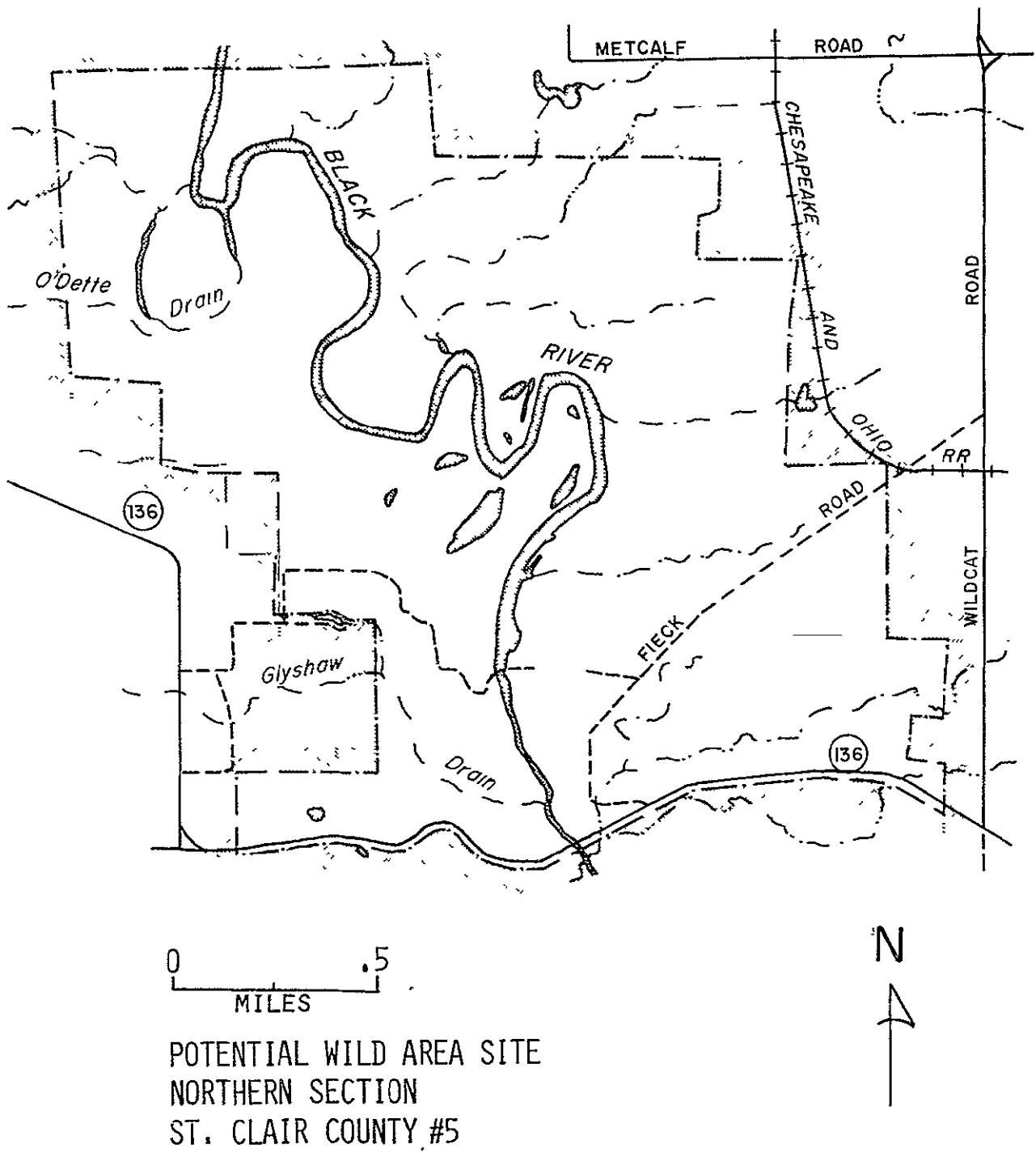


Figure A26.

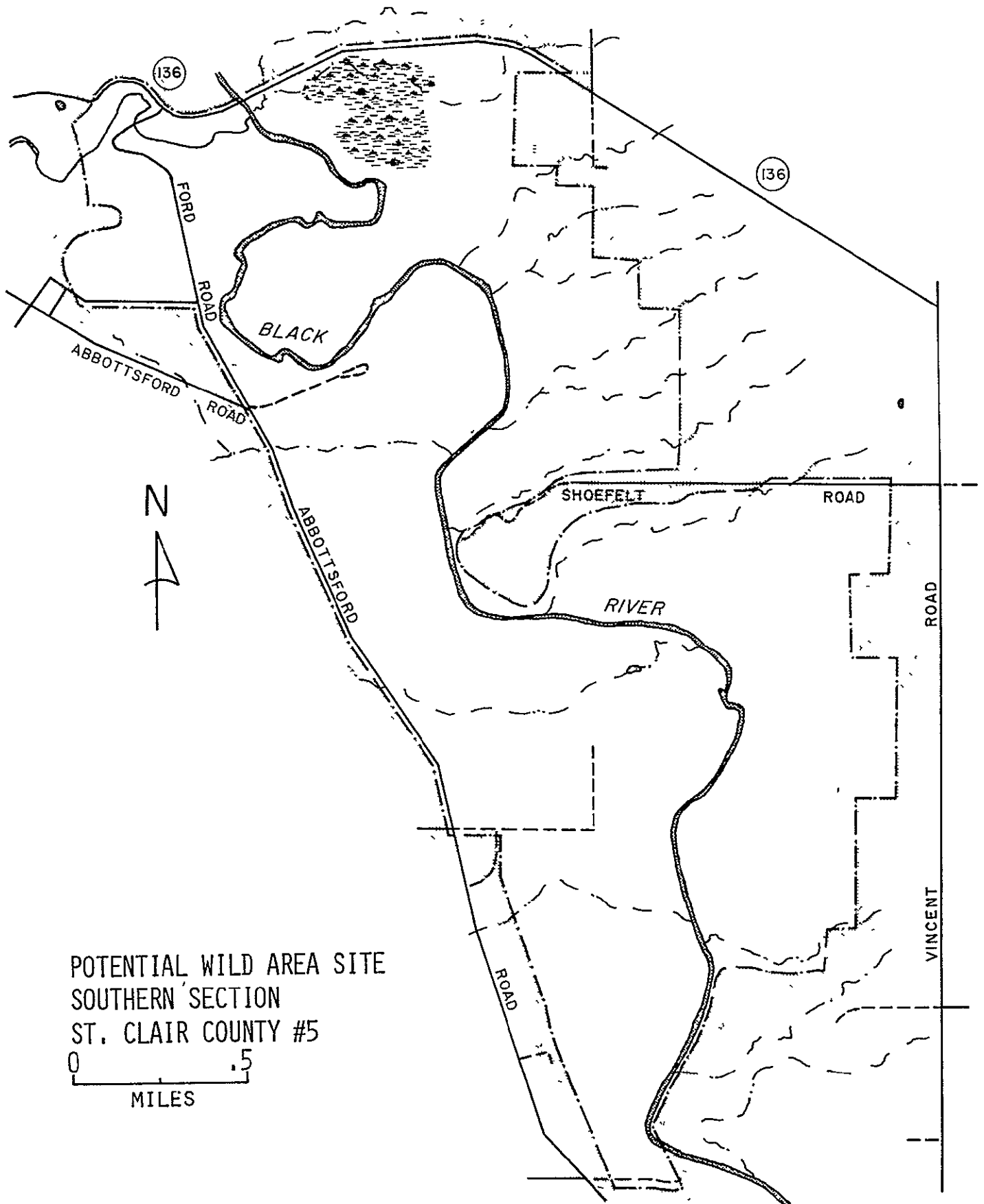
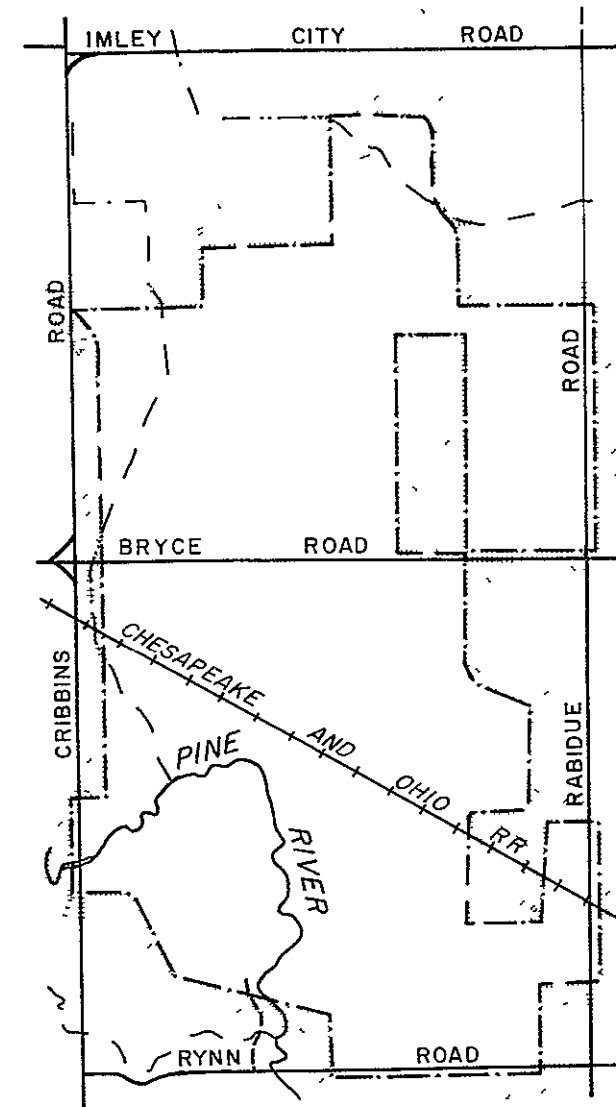


Figure A27.

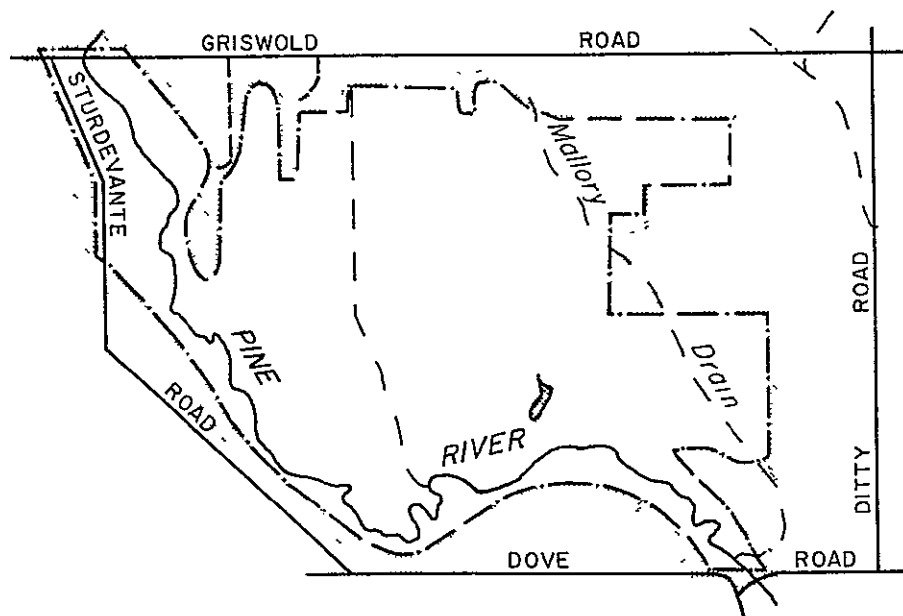


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POTENTIAL WILD AREA SITE  
ST. CLAIR COUNTY #6



Figure A28.



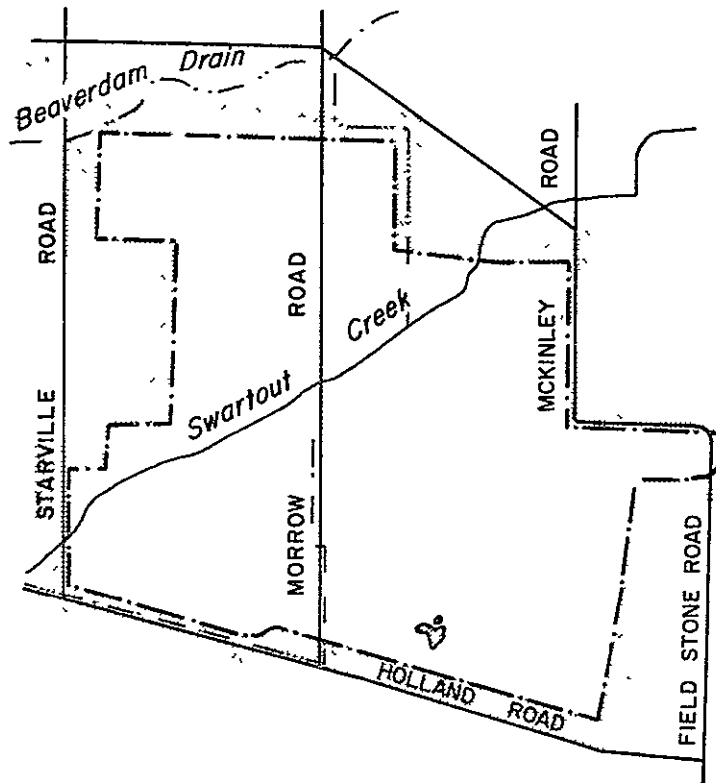
POTENTIAL WILD AREA SITE  
ST. CLAIR COUNTY #9

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Figure A29.





POTENTIAL WILD AREA SITE  
ST. CLAIR COUNTY #11

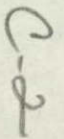
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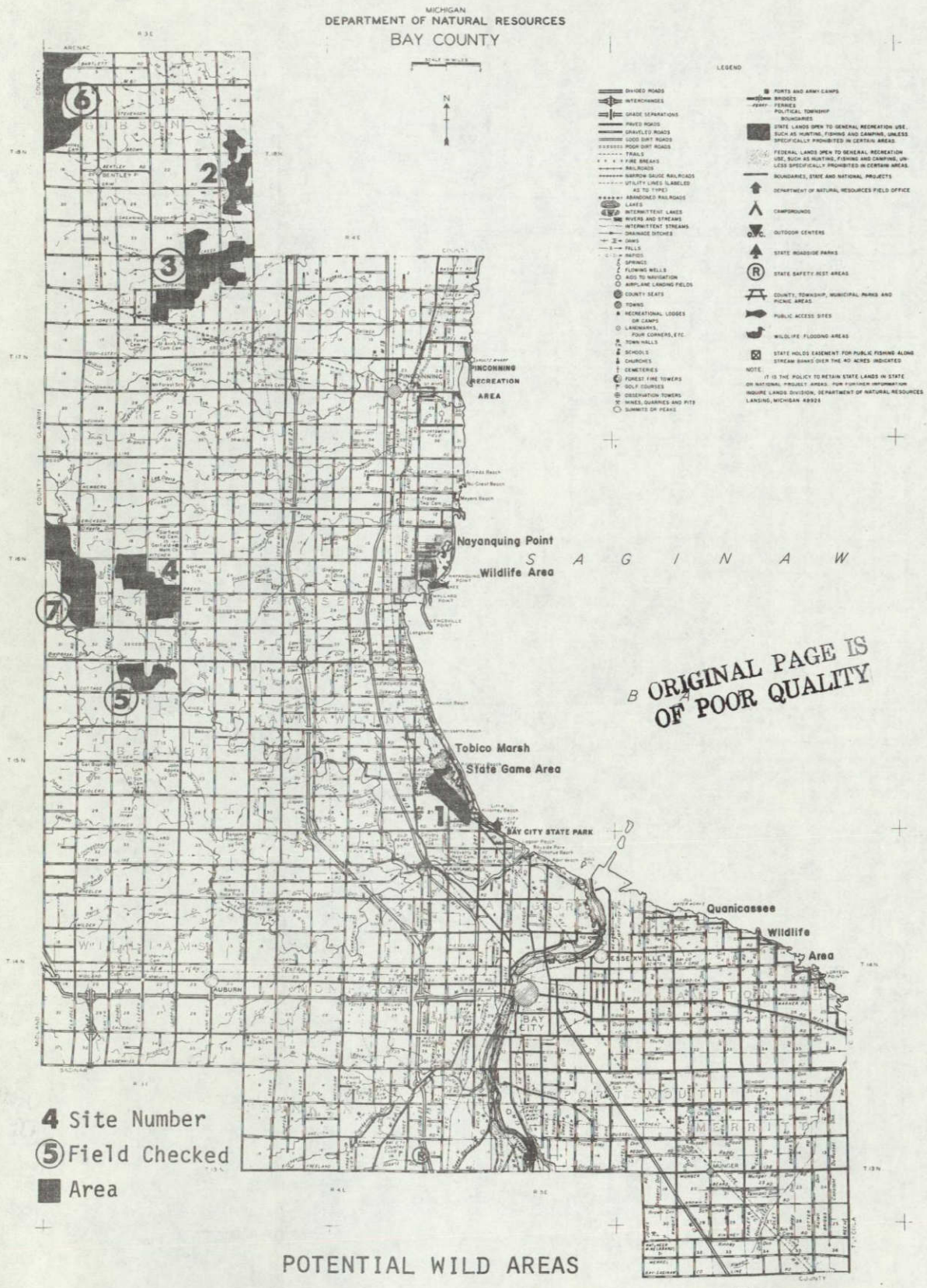
Figure A30.

## APPENDIX B.

-90-



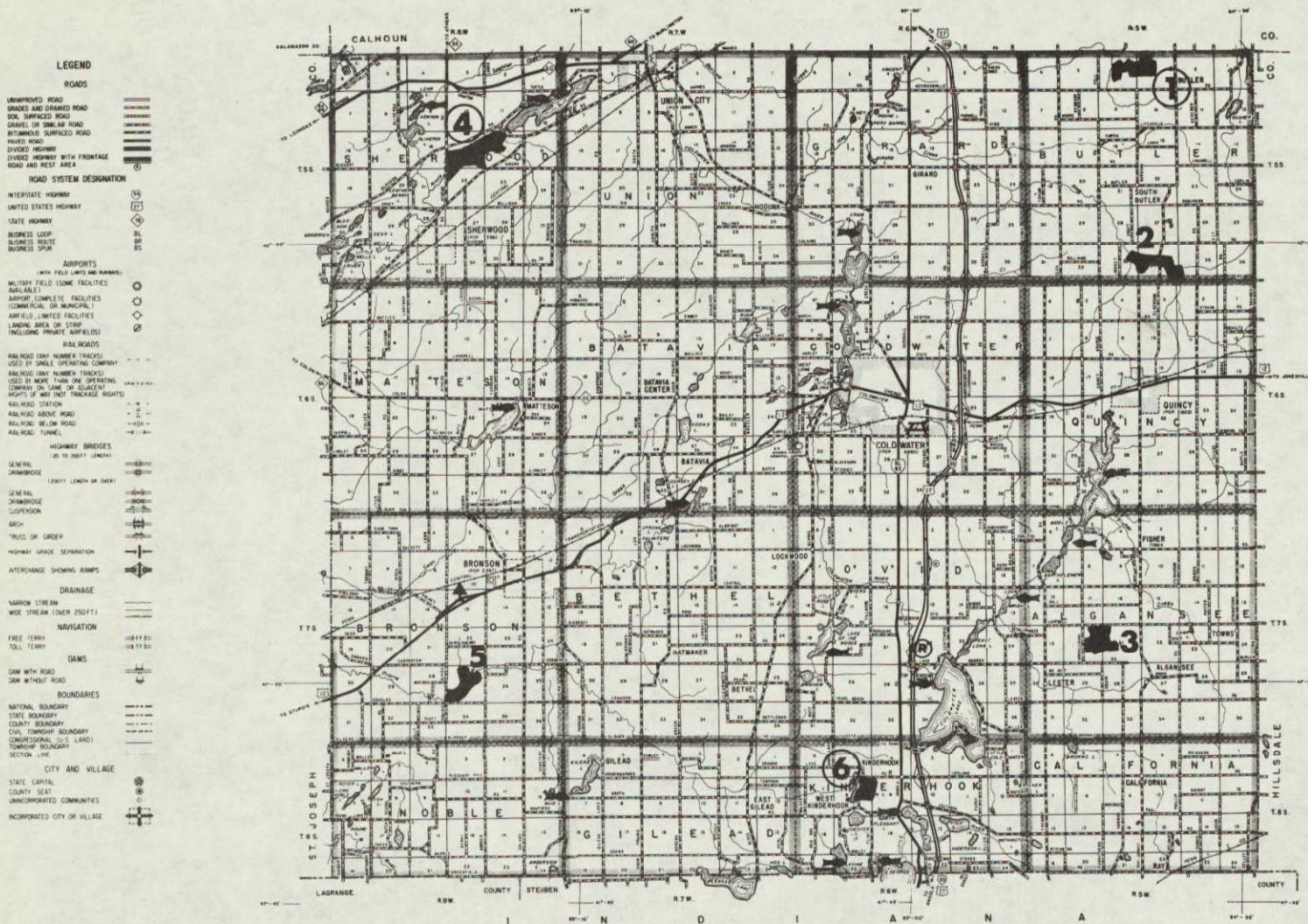




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# POTENTIAL WILD AREAS



2 Site Number  
 6 Field Checked  
 Area

Figure B3.

MICHIGAN  
 DEPARTMENT OF NATURAL RESOURCES  
 BRANCH COUNTY

SCALE IN MILES



BASE MAP BY MICH. DEPT. OF STATE HIGHWAYS

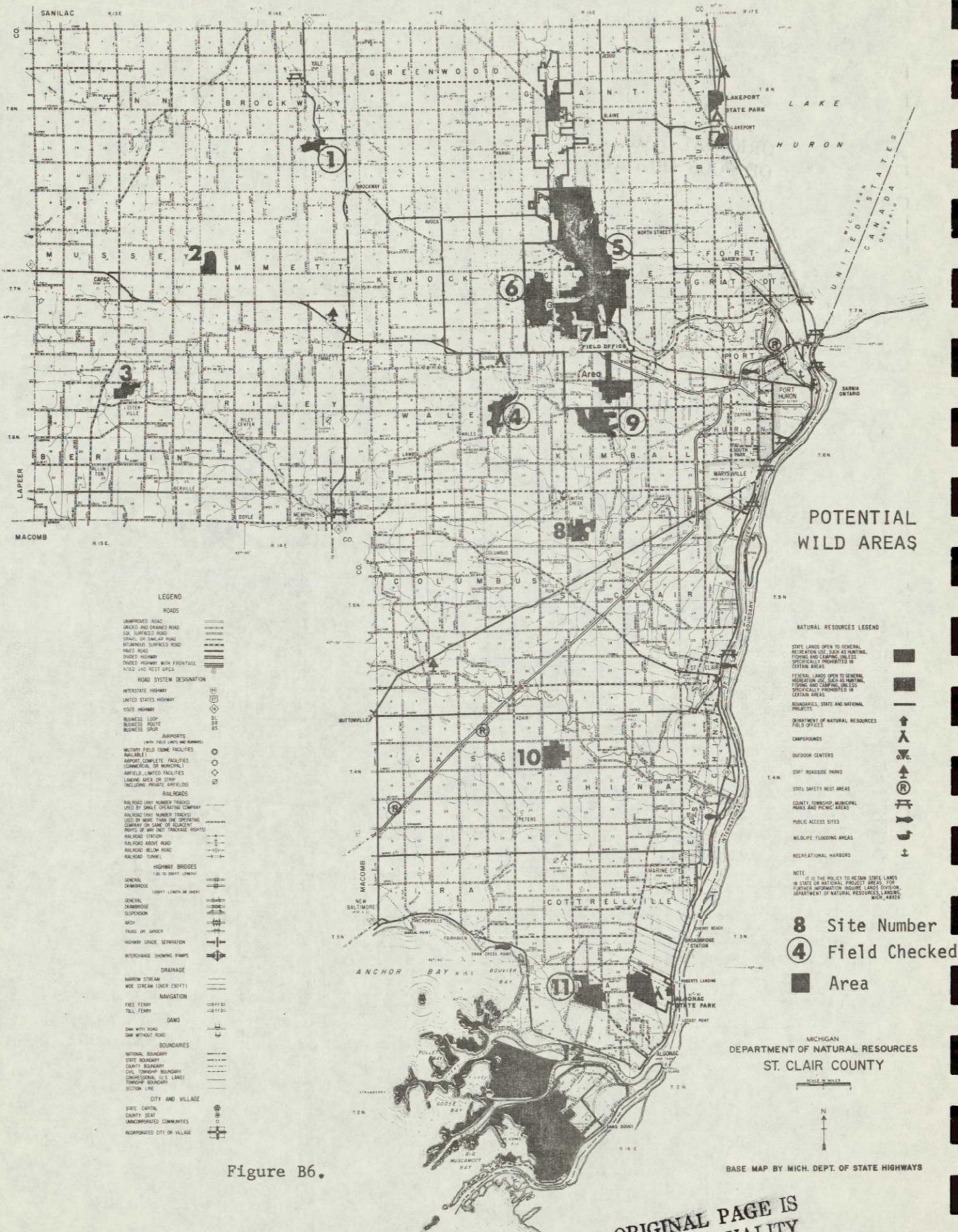
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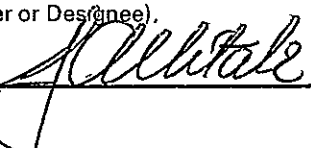






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